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DEPARTMENT OF THE INTERIOR

UNITED STATES BUREAU OF MINES
JOHN W. FINCH, DIRECTOR

INFORMATION CIRCULAR

# TABULAR INDEX OF BUREAU OF MINES INFORMATION CIRCULARS ON MINING AND MILLING METHODS

BY

J. R. THOENEN

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# TABULAR INDEX OF BUREAU OF MINES INFORMATION CIRCULARS ON MINING AND MILLING METHODS 1/

By J. R. Thoenen 2/

CONTENTS


| | Page |
|---|---|
| Commodity index | 17 |
| Geographic index | 20 |
| Metal mining | 22 |
| Mode of occurrence | 22 |
| Prospecting | 23 |
| Development | 25 |
| Mining methods | 27 |
| Drilling | 29 |
| Blasting | 29 |
| Timbering | 29 |
| Loading | 30 |
| Hauling | 31 |
| Power | 33 |
| Extraction | 33 |
| Drainage | 33 |
| Ventilation | 33 |
| Miscellaneous | 34 |
| Wage-contract-bonus | 34 |
| Safety and accident prevention | 34 |
| Plant organization | 34 |
| Costs-dollars | 35 |
| Exploration | 35 |
| Prospecting | 35 |
| Development | 35 |
| Mining | 39 |
| Costs-material units | 46 |
| Development | 47 |
| Mining | 46 |
| Costs-labor units | 48 |
| Development | 48 |
| Mining | 50 |
| Costs-power units | 54 |
| Development | 54 |
| Mining | 55 |
| Ore dressing | 58 |
| Plant equipment | 58 |
| Plant research | 58 |
| Type of ore | 58 |
| Ore analysis | 58 |
| Plant capacity | 58 |
| Sampling equipment | 58 |
| Sampling | 59 |
| Flow sheets | 59 |
| Milling details | 60 |
| Crushing | 60 |
| Grinding | 61 |
| Washing | 61 |
| Conveying | 61 |
| Elevating | 63 |
| Sizing | 63 |
| Screen analysis | 64 |
| Concentration | 66 |
| Dewatering | 67 |
| Tailings disposal | 68 |
| Water supply | 68 |
| Power supply | 69 |
| Beneficiation | 69 |
| Roasting | 69 |
| Leaching | 69 |
| Cyanidation | 69 |
| Amalgamation | 70 |


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2/ Senior mining engineer, U.S. Bureau of Mines.

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CONTENTS (Cont'd.)


| | Page |
|---|---|
| Ore dressing (Cont'd.) | |
| Milling recovery | 70 |
| Costs-dollars | 71 |
| Costs-material units | 74 |
| Costs-labor units | 75 |
| Costs-power units | 76 |
| Nonmetal mining | 79 |
| Mode of occurrence | 79 |
| Prospecting | 80 |
| Development | 81 |
| Mining methods | 83 |
| Drilling | 84 |
| Blasting | 84 |
| Timbering | 85 |
| Loading | 85 |
| Hauling | 86 |
| Power | 87 |
| Installed drive | 87 |
| Extraction | 87 |
| Drainage | 87 |
| Ventilation | 87 |
| Wage-contract-bonus | 88 |
| Safety and accident prevention | 88 |
| Plant organization | 88 |
| Costs-dollars | 88 |
| Prospecting | 88 |
| Development | 89 |
| Mining | 90 |
| Costs-material units | 93 |
| Mining | 93 |
| Costs-labor units | 94 |
| Development | 94 |
| Mining | 94 |
| Costs-power units | 95 |
| Mining | 95 |
| Nonmetal milling | 96 |
| Sampling | 96 |
| Flow sheets | 96 |
| Milling details | 96 |
| Crushing | 96 |
| Grinding | 97 |
| Washing | 97 |
| Conveying | 97 |
| Elevating | 98 |
| Sizing | 99 |
| Grizzlies | 99 |
| Screens | 99 |
| Classifiers | 99 |
| Screen analyses | 99 |
| Concentration | 100 |
| Dewatering | 100 |
| Waste disposal | 100 |
| Storage | 100 |
| Water supply | 101 |
| Power supply | 101 |
| Installed drive | 101 |
| Costs-dollars | 103 |
| Costs-material units | 104 |
| Costs-labor units | 105 |
| Costs-power units | 105 |


## INTRODUCTION

During the past 6 years the Mining Division of the U.S. Bureau of Mines has prepared many information circulars containing valuable technical data covering the operating details of mining and ore-dressing plants throughout the United States, Canada, Mexico, and other countries. These papers, written for the most part by operating officials in the field, have been designed to comprise a reference library for the operating engineer. In order to make the information contained in these publications more readily available to the busy engineer the enclosed series of reference tables has been compiled. The tabular arrangement is by subject rather than alphabetical order, thus avoiding the bulk of an alphabetical index.



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The publications covered by these reference tables have been issued as information circulars, numbered from 6000 up. In addition reference is made to a few reports issued as reports of investigations to which numbers from 2000 to 6000 have been allocated.

## EXPLANATION

All references are by subject, as listed in the accompanying table of contents. Direct reference is given to the publication by number, followed by a dash and the page number or numbers in that publication. For example, from the table of contents references to metal-mine prospecting are given on page 24. The table on that page lists in columnar form various methods of prospecting, and each column shows the publication number and page wherein information dealing with the column head may be found as - Drilling, churn-6113-2 means information on churn-drill prospecting for metal mines may be found in Information Circular 6113, page 2. Similar information for nonmetallic mines may be found on page 80.

Tabular references follow a list of papers from which the references are derived. Those papers indicated by an asterisk are out of print and available only in public libraries.

Complete lists of Bureau of Mines publications are printed periodically.

## INFORMATION CIRCULARS

### COAL-MINING METHODS

*6119. Method and Cost of Mining the Thick Freeport Coal in a Western Pennsylvania Mine, by J. W. Paul and H. Tomlinson. 1929. 18 pp., 18 figs.

*6151. Method and Cost of Mining the Upper and Lower Freeports and the Lower Kittanning in a Group of Mines in Western Central Pennsylvania, by J. W. Paul and H. Tomlinson. 1929. 14 pp., 11 figs.

*6152. Method and Cost of Mining the Thick Freeport Coal in a Second Western Pennsylvania Mine, by J. W. Paul and H. Tomlinson. 1929. 19 pp., 15 figs.

6200. Method and Cost of Mining the Pittsburgh, or No. 8 Coal Bed in a 100 Percent Mechanized Mine in Eastern Ohio, by W. F. Hazen and E. J. Christy. 1929. 21 pp., 8 figs.

*6208. Method and Cost of Mining the Pittsburgh, or No. 8 Coal Bed in Four Eastern Ohio Mines, by J. W. Paul and H. Tomlinson. 1929. 21 pp., 9 figs.

6225. Reducing Accidents from Falls of Roof in Coal Mines, by J. W. Paul, H. Tomlinson, and C. W. Owings. 1930. 13 pp.

6277. Driving Rock Slopes at the New Peerless Mine, by Robert Howard. 1930. 8 pp., 5 figs.

6315. What the Coal Miner Can Do to Prevent Injury from Falls of Roof, by J. W. Paul. 1930. 4 pp.



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6344. What the Mine Foreman Can Do to Prevent Injury from Falls of Roof in Coal Mines, by J. W. Paul. 1930. 7 pp.

6345. What the Superintendent of a Coal Mine Might do to Prevent Injury from Falls of Roof, by J. W. Paul. 1930. 5 pp.

6376. Method of Mining a Thick Coal Bed in Eastern Utah, by H. Tomlinson. 1930. 12 pp., 7 figs.

6378. Shaft Sinking at the Sevier Valley Coal Co. Mine, by H. Tomlinson. 1930. 9 pp., 8 figs.

6570. How to Prevent Death and Injury from Falls of Roof in Coal Mines, by J. W. Paul. 1932. 13 pp.

6722. Timber Withdrawing and Devices Used for This Purpose in Some Coal Mines, by J. W. Paul and J. C. Calverley. 1933. 15 pp., 8 figs.

6727. Factors and Conditions That Aid in Alinement of Pillar Extraction Lines in Coal Mining, by J. N. Geyer. 1933. 23 pp., 15 figs.

6738. Blasting Practices as They Affect the Roof of Coal Mines in Ohio, Pennsylvania, and West Virginia, by J. N. Geyer. 1933. 11 pp., 4 figs.

## METAL MINING METHODS

*6092. Method and Cost of Mining Magnetite in the Mineville District, New York, by A. M. Cummings. 1928. 12 pp., 12 figs.

6107. Mining Practice at Morenci Branch, Phelps Dodge Corporation, Morenci, Arizona, by McHenry Mosier and Gerald Sherman. 1929. 33 pp., 17 figs.

*6113. Method and Cost of Mining Zinc and Lead at No. 1 Mine, Tri-State Zinc and Lead District, Picher, Okla., by Wm. F. Netzeband. 1929. 11 pp., 7 figs.

*6121. Methods and Cost of Mining Zinc and Lead at Mine No. 2, Tri-State District, Picher, Okla., by Wm. F. Netzeband. 1929. 11 pp., 6 figs.

*6133. Method and Cost of Mining Hard Specular Hematite on the Marquette Range, Michigan, by Lucien Eaton. 1929. 14 pp., 7 figs.

*6145. Mining Methods at Minas de Matahambre, Matahambre, Pinar del Rio, Cuba, by George L. Richert. 1929. 18 pp.

*6149. Mining Methods of the Tennessee Copper Co., Ducktown, Tenn., by C. H. McNaughton. 1929. 17 pp., 9 figs.

6150. Mining Methods and Costs in the Waco District, by Leon M. Banks. 1929. 10 pp., 12 figs.

*6159. Method and Cost of Mining at Barr Mine, Tri-State Zinc and Lead District, by Oliver W. Keener. 1929. 9 pp., 5 figs.

*6160. Method and Cost of Mining at No. 8 Mine, St. Louis Smelting & Refining Co., Southeast Missouri District, by Roy H. Poston. 1929. 22 pp., 15 figs.

*6167. Mining Practice at Ray Mines, Nevada Consolidated Copper Co., Ray, Ariz., by Robert W. Thomas. 1929. 27 pp., 16 figs.

*6168. Mining Methods and Costs at the Magma Mine, Superior, Ariz., by Fred W. Snow. 1929. 32 pp., 17 figs.



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*6169. Mining Practice and Methods at Inspiration Consolidated Copper Co., Inspiration, Ariz., by Alfred C. Stoddard. 1929. 23 pp., 14 figs.

*6170. Methods of Mining Disseminated Lead Ore at a Mine in the Southeast Missouri District, by Chas. F. Jackson. 1929. 21 pp., 8 figs.

*6174. Method and Cost of Mining Zinc and Lead at No. 3 Mine, Tri-State District, Crestline, Kans., by Wm. F. Netzeband. 1929. 10 pp., 6 figs.

6179. Mining Soft Hematite at Mine No. 2 of the Marquette Range, Mich., by Lucien Eaton. 1929. 15 pp., 7 figs.

*6180. Mining Soft Hematite by Open Stopes at Mine No. 1, Menominee Range, Mich., by Lucien Eaton. 1929. 10 pp., 6 figs.

*6186. Mining Methods and Costs, Alaska Juneau Gold Mining Co., Juneau, Alaska, by P. R. Bradley. 1929. 18 pp., 6 figs.

6193. Mining Ore in Open Stopes, Central and Eastern United States, by Chas. F. Jackson. 1929 (revised in 1931). 36 pp., 13 figs.

*6232. Mining Method and Costs at the Hecla and Star Mines, Burke, Idaho, by Chas. H. Foreman. 1930. 21 pp., 12 figs.

*6234. Mining Method and Costs at the Utah Copper Co., Bingham Canyon, Utah, by Adolph Soderburg. 1930. 23 pp., 11 figs.

*6237. Mining Methods at the Old Dominion Mine, Globe, Ariz., by A. H. Shoemaker. 1930. 21 pp., 11 figs.

*6238. Mining Methods at the Morning Mine of the Federal Mining and Smelting Co., Mullan, Idaho, by C. E. Wethered and Leo J. Coady. 1930. 13 pp., 7 figs.

*6239. Mining Methods and Costs, American Zinc Company of Tennessee, Mascot, Tenn., by Harley A. Coy. 1930. 11 pp., 14 figs.

*6240. Mining Practice at Harmony Mines Co., Baker, Idaho, by R. Duncan Gardner. 1930. 8 pp., 4 figs.

*6247. Mining Methods, Practices, and Costs of the Cananea Consolidated Copper Co., Sonora, Mexico, by William Catron. 1930. 41 pp., 25 figs.

*6248. Methods and Costs of Stripping and Mining at the United Verde Open-Pit Mine, Jerome, Ariz., by E. M. J. Alenius. 1930. 34 pp., 13 figs.

*6250. Mining Practice and Methods at the United Verde Extension Mining Co., Jerome, Ariz., by Richard L. D'Arcy. 1930. 11 pp., 20 figs.

*6254. The Methods of Underground Mining of Iron Ore in the District of Krivoy Rog, by A. K. Bouldovsky. 1930. 48 pp., 123 figs.

*6260. Mining Methods and Costs at the Engels Mine, Plumas County, Calif., by W. I. Nelson. 1930. 22 pp., 24 figs.

*6276. Mining Methods & Costs at the Black Butte Quicksilver Mine, Lane County, Oreg., by William W. Elmer. 1930. 8 pp., 3 figs.

*6284. Method and Costs of Mining Tungsten Ore at the Nevada-Mass. Mines at Mill City, Nev., by Ott F. Heizer. 1930. 13 pp., 7 figs.

*6286. Methods and Costs of Mining at the Hartley-Grantham Mine, Tri-State Zinc and Lead District, by Oliver W. Keener. 1930. 8 pp., 8 figs.



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6289. Mining Methods at the Campbell Mine of the Calumet & Arizona Mining Co., Warren, Ariz., Inclined Cut-and-Fill and Semishrinkage, by H. M. Lavender. 1930. 18 pp., 13 figs.

*6290. Mining Methods and Costs at the Park Utah Mine, Park City, Utah, by E. A. Hewitt. 1930. 18 pp., 13 figs.

6293. Shrinkage Stoping, by Chas. F. Jackson. 1930. 54 pp., 23 figs.

*6307. Mining Methods & Costs at the Pilares Mine, Pilares de Nacazari, Sonora, Mexico, by Everard Leland. 1930. 34 pp., 23 figs.

*6311. Mining Methods and Costs at the Argonaut Mine, Amador County, Calif., by Wm. O. Vanderburg. 1930. 14 pp., 10 figs.

6322. Mining Methods and Costs at the Teck-Hughes Gold Mines (Ltd.), Kirkland Lake, Ontario, by R. J. Henry. 1930. 21 pp., 4 figs.

*6325. Underground Mining Practice and Costs at a Mesabi Range (Minn.) Mine Using Top-Slicing System, by W. D. Haselton. 1930. 11 pp., 10 figs.

6326. Some Notes on Underground Transportation, by Chas. F. Jackson. 1930. 40 pp., 33 figs.

*6327. Mining Methods and Costs at the Consolidated Cortez Silver Mine, Cortez, Nev., by Geo. W. Hezzelwood. 1930. 15 pp., 13 figs.

6348. Method and Cost of Mining Hematite at the Eureka-Asteroid Mine on the Gogebic Range, Gogebic County, Mich., by O. M. Schaus. 1930. 13 pp., 6 figs.

*6350. Undercut Block-Caving Method of Mining in Western Copper Mines, by E. D. Gardner. 1930. 44 pp., 35 figs.

*6360. Mining Method and Costs at Tintic Standard Mine, Tintic District, Utah, by W. I. Nelson. 1930. 21 pp., 26 figs.

6361. Mining and Engineering Methods and Costs of the Hanover Bessemer Iron & Copper Co., Fierro, N. Mex., by Lloyd M. Kniffin. 1930. 20 pp., 14 figs.

*6368. Mining Practice at the Pecos Mine of the American Metal Co. of New Mexico, by J. T. Matson and C. Hoag. 1930. 21 pp., 15 figs.

*6369. Mining Methods and Costs at the Montreal Mine, Montreal, Wis., by O. M. Schaus. 1930. 29 pp., 51 figs.

*6370. Methods of Mining at the Black Rock Mine, Butte and Superior Mining Co., Butte District, Montana, by D. B. McGilvra and A. J. Healy. 1930. 16 pp., 9 figs.

*6371. Mining Methods and Costs of the Silver King Coalition Mines Company, Park City, Utah, by M. J. Dailey. 1930. 12 pp., 9 figs.

*6372. Mining Methods at the Page Mine of the Federal Mining and Smelting Co., Page, Idaho, by J. E. Berg. 1930. 8 pp. 8 figs.

*6377. Mining Methods and Costs at the Ground Hog Unit, Asarco Mining Co., Vanadium, N. Mex., by F. A. Richard. 1930. 13 pp., 6 figs.

*6380. Mining Practices, Methods, and Costs at Mine No. 5 of the Marquette Range, Mich., by W. W. Graff. 1930. 10 pp., 5 figs.

6382. Mine Ventilation in the Coeur d'Alene Mining District, by G. E. McElroy. 1931. 37 pp., 5 figs.

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6397. Mining Methods of the Ducktown Chemical & Iron Co., Mary Mine, Isabella, Tenn., by Verne L. Kegler. 1931. 9 pp., 8 figs.

*6399. Construction of Wachusett-Coldbrook Tunnels, by Douglas C. Corner. 1931. 6 pp., 5 figs.

*6402. Mining Methods and Costs at the Spring Hill Mine, Montana Mine Corporation, Helena, Mont., by A. L. Pierce. 1931. 11 pp., 6 figs.

*6407. Mining Methods of the Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho, by U. E. Brown. 1931. 9 pp., 17 figs.

*6410. Mining by the Top-Slicing Method, with Some Notes on Sublevel Caving, by Chas. F. Jackson. 1931. 51 pp., 32 figs.

*6412. Mining Practice at the Chino Mines, Nevada Consolidated Copper Co., Santa Rita, N. Mex., by H. A. Throne. 1931. 28 pp., 14 figs.

*6413. Mining Methods at the Eighty-Five Mine, Calumet and Arizona Mining Co., Valedon, N. Mex., by Ralph B. Youtz. 1931. 26 pp., 17 figs.

6416. Mining Methods at the Block P Mine of the St. Joseph Lead Co., Hughesville, Mont., by Wm. O. Vanderburg. 1931. 14 pp., 10 figs.

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6462. Methods and Costs of Mining Quicksilver Ore at the New Idria Mine, San Benito County, Calif., by W. R. Moorehead. 1931. 14 pp., 8 figs.

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6470. Mining Methods and Costs at the Porcupine United Gold Mines' Rochester Mines at Timmins, Ontario, by J. D. Tolman. 1931. 6 pp., 2 figs.

6430. Tunnel Driving Methods Used at the Ojuela Unit of the Compania Minera de Penoles, S. A., Ojuela, Durango, Mexico, by John P. Savage. 1931. 8 pp., 6 figs.

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6490. Mining Methods of Kirkland Lake Gold-Mining Co. (Ltd.) at Kirkland Lake, Ontario, by J. C. Dumbrille. 1931. 12 pp., 3 figs.

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6503. Mining Methods and Costs at Metal Mines of the United States, by C. W. Wright. 1931. 39 pp., 34 figs.

6512. Mining Methods and Costs at the Central-Eureka Mine, Amador County, Calif., by James Spiers. 1931. 12 pp., 18 figs.

6514. Mining Methods of the Molybdenum Corporation of America at Questa, N. Mex., by J. B. Carman. 1931. 15 pp., 5 figs.

6515. Mining Methods and Costs at the Champion Copper Mine, Painesdale, Mich., by Albert Mendelsohn. 1931. 16 pp., 17 figs.

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6526. Deep Mining Methods, Conglomerate Mine of the Calumet & Hecla Consolidated Copper Co., Michigan, by Harry Vivian. 1931. 20 pp., 18 figs.

6543. Mining Practices, Methods, and Costs at Elkoro Mines, Jarbidge, Nev., by John Furness Park. 1931. 12 pp., 4 figs.

6565. Mining Practice at Braden Copper Co.'s Mines, Sewell, Chile, by J. S. Webb and T. W. Skinner. 1932. 13 pp., 14 figs.

6585. Economic Size of Metal-Mine Airways, by G. E. McElroy. 1932. 21 pp., 4 figs.

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6588. Sinking Practice and Costs at the Pim Shaft, St. Louis Smelting and Refining Works of the National Lead Co., St. Francois, Mo., by Roy H. Poston. 1932. 13 pp., 7 figs.

6591. The Cost of Developing to the Operating Stage and Equipping a Small or Medium-Sized Mine in the Tri-State Lead and Zinc District, by John R. Reigart. 1932. 18 pp., 3 figs.

6594. Sampling and Exploration by Means of Hammer Drills, by John B. Knaebel, 1932. 29 pp., 3 figs.

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6602. Shaft-Sinking Methods, Practices, and Costs of the Consolidation Coal Co. at Its No. 261 Mine, Caretta, McDowell County, W. Va., by Laurence E. Kelley. 1932. 15 pp., 6 figs.

6611. Small-Scale Placer Mining Methods, by Chas. F. Jackson and John B. Knaebel. 1932. 17 pp., 25 figs.

*6612. Gold Mining and Milling Methods and Costs at the Vallecito Western Drift Mine, Angels Camp, Calif., by Don Steffa. 1932. 13 pp., 4 figs.

6613. Factors Governing the Selection of the Proper Level Interval in Underground Mines, by Wm. O. Vanderburg. 1932. 17 pp., 1 fig.

6622. Employee-Timekeeping System and Mechanical Pay-Roll Methods at Britannia Mining & Smelting Co. (Ltd.), Britannia Beach, B. C., by Albert E. Keller and E. C. Gillingham. 1932. 6 pp., 10 figs.

6623. Procedure of the Purchasing and Supply Departments of the Miami Copper Co., Miami, Ariz., by Fred L. Bishop and Albert E. Keller. 1932. 12 pp., 22 figs.

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6651. Abstracts of Recent Articles on Mine Support, by W. R. Crane. 1932. 23 pp.

6656. Mining Methods and Costs at the Interstate Zinc & Lead Co.'s Hartley Mine, Tri-State Zinc and Lead District, by Carl N. Anderson. 1932. 16 pp., 10 figs.



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*6659. Methods and Costs of Dredging Auriferous Gravels at Lancha Plana, Amador County, Calif., by Charles G. Patmon. 1932. 16 pp., 3 figs.

*6660. Description of the Property and Operations of the Lewiston Dredge, Lewiston, Calif., by Lawrence K. Requa. 1932. 14 pp., 5 figs.

6661. Mining Methods and Costs at Fresnillo, Zacatecas, Mexico, by A. Livingston. 1932. 31 pp., 17 figs.

6662. Mining Methods and Costs at the Vanadium Mine of the United States Vanadium Corporation, Rifle, Colo., by Blair Burwell. 1932. 9 pp., 9 figs.

6663. Pressure Losses Due to Bends and Area Changes in Mine Airways, by G. E. McElroy. 1932. 34 pp., 12 figs.

*6666. Mining Methods and Costs at the New Cornelia Branch, Phelps Dodge Corporation, Ajo, Ariz., by Geo. R. Ingham and Alfred T. Barr. 1932. 17 pp., 17 figs.

*6673. Methods and Costs of Mining Ferberite Ore at the Cold Springs Mine, Nederland, Boulder County, Colo., by William O. Vanderburg. 1932. 15 pp., 2 figs.

6674. Shaft-Sinking Methods and Costs, and Cost of Plant and Equipment at the Macassa Mine, Kirkland Lake, Ontario, by G. A. Howes and Chas. F. Jackson. 1932. 10 pp., 3 figs.

*6679. Supplementary Notes on Core Drilling in the Salt Beds of Western Texas and New Mexico: Tests 13 to 24, by E. P. Hayes. 1933. 11 pp.

*6681. Method and Cost of Exploring, Equipping for Development, and Developing the Central Patricia Group of Claims, Northern Ontario, by A. J. Keast and Chas. F. Jackson. 1933. 13 pp., 5 figs.

*6688. Cut-and-Fill Stoping, by C. H. Johnson and E. D. Gardner. 1933. 58 pp., 26 figs.

*6691. Square-Set System of Mining, by E. D. Gardner and Wm. O. Vanderburg. 1933. 73 pp., 48 figs.

*6693. Some Notes on Methods and Costs of Equipping and Developing Prospects, by Chas. F. Jackson. 1933. 24 pp.

*6707. Methods and Costs of Developing and Equipping the Ashley Gold Mine, Matachewan Gold District, Ontario, by W. H. Emens and Chas. F. Jackson. 1932. 28 pp., 5 figs.

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*6709. Mining Methods and Costs at Granada Gold Mines (Ltd.), Rouyn, Quebec, by R. L. Loofbourow. 1933. 15 pp., 4 figs.

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NONMETALLIC METHODS

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# COMMODITY INDEX

## METAL MINING

### Surface

| Copper | Lead | Zinc | Iron | Gold | Silver | Quicksilver | Tungsten | Molybdenum | Vanadium |
|---|---|---|---|---|---|---|---|---|---|
| 6234 | 6503 | 6248 | 6325 | 6503 | | 6462 | | | |
| 6248 | | 6503 | 6503 | 6611 | | | | | |
| 6412 | | | | 6659 | | | | | |
| 6479 | | | | 6660 | | | | | |
| 6503 | | | | 6786 | | | | | |
| 6666 | | | | 6787 | | | | | |
| 6708 | | | 3266 | 6783 | | | | | |

### Underground

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6107 | 6113 | 6113 | 6092 | 6168 | 6168 | 6276 | 6284 | 6514 | 6662 |
| 6145 | 6121 | 6121 | 6138 | 6186 | 6238 | 6462 | 6532 | | |
| 6149 | 6159 | 6150 | 6179 | 6311 | 6290 | | 6673 | | |
| 6167 | 6160 | 6159 | 6180 | 6322 | 6327 | | | | |
| 6168 | 6170 | 6174 | 6254 | 6402 | 6360 | | | | |
| 6169 | 6174 | 6238 | 6325 | 6447 | 6371 | | | | |
| 6237 | 6232 | 6239 | 6348 | 6470 | 6407 | | | | |
| 6240 | 6238 | 6286 | 6361 | 6476 | 6447 | | | | |
| 6247 | 6286 | 6290 | 6369 | 6490 | 6480 | | | | |
| 6250 | 6290 | 6368 | 6380 | 6503 | 6543 | | | | |
| 6260 | 6360 | 6370 | 6390 | 6512 | 6661 | | | | |
| 6289 | 6368 | 6372 | 6503 | 6525 | 6736 | | | | |
| 6307 | 6370 | 6377 | 6601 | 6543 | 6785 | | | | |
| 6397 | 6371 | 6397 | 6785 | 6612 | 6804 | | | | |
| 6413 | 6372 | 6416 | | 6674 | 6815 | | | | |
| 6440 | 6377 | 6447 | | 6681 | 6823 | | | | |
| 6464 | 6397 | 6503 | | 6707 | 6824 | | | | |
| 6467 | 6407 | 6586 | | 6709 | | | | | |
| 6503 | 6416 | 6591 | | 6735 | | | | | |
| 6515 | 6447 | 6656 | 3266 | 6741 | | | | | |
| 6526 | 6480 | 6736 | | 6785 | | | | | |
| 6565 | 6503 | 6776 | | 6799 | | | | | |
| 6622 | 6588 | 6785 | | 6800 | | | | | |
| 6623 | 6591 | 6815 | | 6806 | | | | | |
| 6736 | 6656 | | | 6815 | | | | | |
| 6785 | 6776 | | | 6823 | | | | | |
| 6815 | 6785 | | | 6824 | | | | | |



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## COMMODITY INDEX - Continued

### ORE DRESSING

| Copper | Lead | Zinc | Iron | Gold | Silver | Quick-silver | Tungsten | Molybdenum | Chromite | Manganese |
|---|---|---|---|---|---|---|---|---|---|---|
| 6241 | 6314 | 6314 | 6574 | 6236 | 6314 | 6429 | 6280 | 6551 | | |
| 6261 | 6320 | 6342 | 6624 | 6314 | 6320 | | 6532 | | | |
| 6285 | 6342 | 6353 | | 6320 | 6359 | | 6604 | | | |
| 6303 | 6353 | 6359 | | 6408 | 6430 | | 6685 | | | |
| 6314 | 6359 | 6379 | | 6411 | 6447 | | | | | |
| 6319 | 6430 | 6430 | | 6433 | 6497 | | | | | |
| 6320 | 6447 | 6447 | | 6447 | 6555 | | | | | |
| 6343 | 6492 | 6492 | | 6476 | 6600 | | | | | |
| 6357 | 6497 | 6497 | | 6503 | 6605 | | | | | |
| 6358 | 6574 | 6574 | | 6541 | 6706 | | | | | |
| 6359 | 6587 | 6587 | | 6555 | 6730 | | | | | |
| 6364 | 6590 | 6590 | | 6605 | 6736 | | | | | |
| 6394 | 6600 | 6600 | | 6612 | 6739 | | | | | |
| 6404 | 6605 | 6605 | | 6707 | 6824 | | | | | |
| 6425 | 6658 | 6706 | | 6730 | | | | | | |
| 6460 | 6706 | 6736 | | 6735 | | | | | | |
| 6467 | 6739 | 6739 | | 6739 | | | | | | |
| 6479 | 6758 | 6758 | | 6742 | | | | | | |
| 6489 | 6759 | | | 6783 | | | | | | |
| 6544 | | | | 6824 | | | | | | |
| 6550 | | | | | | | | | | |
| 6555 | | | | | | | | | | |
| 6573 | | | | | | | | | | |
| 6605 | | | | | | | | | | |
| 6619 | | | | | | | | | | |
| 6730 | | | | | | | | | | |
| 6736 | | | | | | | | | | |
| 6792 | | | | | | | | | | |
| 3112 | 3112 | 3112 | 3045 3052 | 2998 3112 | 3112 | | | | 3049 | 3045 |



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## COMMODITY INDEX - Continued

### NONMETAL MINING AND MILLING

#### Surface

| Stone | Sand & gravel | Coal | Fluorspar | Clay | Potash | Shale | Feldspar | Gypsum | Mica | Salt |
|---|---|---|---|---|---|---|---|---|---|---|
| 6291 | 6420 | | | 6522 | | 6498 | | 6615 | | |
| 6356 | 6421 | | | 6657 | | | | | | |
| 6405 | 6537 | | | | | | | | | |
| 6448 | 6580 | | | | | | | | | |
| 6498 | 6581 | | | | | | | | | |
| 6513 | 6582 | | | | | | | | | |
| 6522 | 6592 | | | | | | | | | |
| 6531 | 6607 | | | | | | | | | |
| 6553 | 6626 | | | | | | | | | |
| 6554 | 6652 | | | | | | | | | |
| 6599 | 6676 | | | | | | | | | |
| 6603 | 6692 | | | | | | | | | |
| 6608 | 6696 | | | | | | | | | |
| 6609 | 6705 | | | | | | | | | |
| 6610 | 6668 | | | | | | | | | |
| 6744 | 6689 | | | | | | | | | |
| | 6798 | | | | | | | | | |
| | 6814 | | | | | | | | | |
| 2911 | 6826 | | | | | | | | | |

#### Underground

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6446 | | 6119 | 6294 | | 6156 | 6446 | 6488 | 6615 | 6616 | 6640 |
| 6795 | | 6151 | 6384 | | 6679 | | | | | |
| | | 6152 | 6621 | | | | | | | |
| | | 6277 | | | | | | | | |
| | | 6378 | | | | | | | | |
| | | 6598 | | | | | | | | |
| | | 6602 | | | | | | | | |
| | | 6797 | | | | | | | | |



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## GEOGRAPHIC INDEX

| Arizona | | California | | | Colorado | | Conn. | Idaho | | Ill. | Ind. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Metal mining | Ore dressing | Metal mining | Ore dressing | Nonmetal | Metal mining | Ore dressing | Nonmetal | Metal mining | Ore dressing | Nonmetal | Nonmetal |
| 6107 | 6241 | 6260 | 6429 | 6607 | 6662 | 6685 | 6676 | 6232 | 6285 | 6294 | 6356 |
| 6167 | 6303 | 6311 | 6476 | 6609 | 6673 | 6739 | | 6238 | 6314 | 6384 | 6603 |
| 6168 | 6319 | 6462 | 6532 | 6610 | 6806 | | | 6240 | 6587 | 6797 | 6692 |
| 6169 | 6343 | 6476 | 6550 | 6705 | | | | 6370 | 6590 | | 6797 |
| 6237 | 6404 | 6512 | 6555 | 6795 | | | | 6407 | 6600 | | |
| 6248 | 6460 | 6532 | 6612 | | | | | 6776 | | | |
| 6250 | 6467 | 6612 | 6824 | | | | | 6823 | | | |
| 6289 | 6489 | 6659 | | | | | | | | | |
| 6440 | 6497 | 6660 | | | | | | | | | |
| 6464 | 6573 | | | | | | | | | | |
| 6467 | 6730 | | 2998 | | | | | | | | |
| 6666 | 6735 | | | | | | | | | | |
| 6708 | | | | | | | | | | | |
| 6735 | | | | | | | | | | | |
| 6799 | | | | | | | | | | | |
| 6824 | | | | | | | | | | | |

| Kans. | Ky. | Md. | Mass. | Michigan | | | Minnesota | | Missouri | | Montana | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metal mining | Nonmetal | Nonmetal | Nonmetal | Metal mining | Ore dressing | Nonmetal | Metal mining | Ore dressing | Metal mining | Ore dressing | Metal mining | Ore dressing |
| 6174 | 6421 | 6554 | 6399 | 6138 | 6357 | 6580 | 6325 | | 6150 | 6658 | 6370 | 6411 |
| 6286 | | | | 6179 | 6364 | 6657 | | | 6159 | | 6402 | 6447 |
| 6591 | | | | 6180 | | | | | 6160 | | 6416 | |
| 6656 | | | | 6348 | | | | | 6170 | | 6447 | |
| | | | | 6380 | | | | | 6588 | | 6776 | |
| | | | | 6390 | | | | | 6591 | | | |
| | | | | 6515 | | | | | 6776 | | | |
| | | | | 6526 | | | | | | | | |
| | | | | | | | | 3045 | | | | |
| | | | | | | | | 3052 | | | | |



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GEOGRAPHIC INDEX - Continued

| Nevada | | | New Jersey | | New Mexico | | | New York | | | Oklahoma | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metal mining | Ore dressing | Nonmetal | Metal mining | Nonmetal | Metal mining | Ore dressing | Nonmetal | Metal mining | Ore dressing | Nonmetal | Metal mining | Ore dressing |
| 6284 | 6280 | 6599 | 6601 | 6420 | 6361 | 6359 | 6156 | 6092 | 6574 | 6522 | 6113 | 6342 |
| 6327 | 6430 | 6615 | 6776 | | 6368 | 6394 | 6679 | 6586 | 6624 | 6592 | 6121 | 6353 |
| 6543 | 6604 | | | | 6377 | 6551 | | 6776 | | | 6591 | |
| 6776 | | | | | 6412 | 6605 | | | | | | |
| | | | | | 6413 | | | | | | | |
| | | | | | 6514 | | | | | | | |
| | | | | | 6776 | | | | | | | |

| Oregon | | Penn. | S.Car. | S.Dak. | Tennessee | | Tex. | Utah | | | W.Va. | Wis. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metal mining | Nonmetal | Nonmetal | Nonmetal | Ore dressing | Metal mining | Ore dressing | Nonmetal | Metal mining | Ore dressing | Nonmetal | Nonmetal | Metal mining |
| 6276 | 6626 | 6119 | 6744 | 6408 | 6149 | 6379 | 6156 | 6234 | 6320 | 6277 | 6602 | 6369 |
| | 6696 | 6151 | | | 6239 | | 6498 | 6290 | 6479 | 6378 | | |
| | | 6152 | | | 6397 | | 6513 | 6360 | 6492 | | | |
| | | 6405 | | | 6776 | | 6531 | 6371 | 6758 | | | |
| | | 6446 | | | | | 6537 | 6479 | 6759 | | | |
| | | 6448 | | | | | 6581 | 6776 | | | | |
| | | 6582 | | | | | 6608 | | | | | |
| | | | | | | | 6640 | | | | | |
| | | | | | | | 6652 | | | | | |
| | | | | | | | 6679 | | | | | |

| Wyo. | Alaska | | Canada | | Mexico | | Cuba | | Russia | Chile |
|---|---|---|---|---|---|---|---|---|---|---|
| Nonmetal | Metal mining | Ore dressing | Metal mining | Ore dressing | Metal mining | Ore dressing | Metal mining | Ore dressing | Metal mining | Metal mining |
| 6598 | 6186 | 6236 | 6322 | 6433 | 6247 | 6261 | 6145 | 6544 | 6254 | 6565 |
| | | | 6470 | 6508 | 6307 | 6358 | | | | |
| | | | 6490 | 6541 | 6480 | 6706 | | | | |
| | | | 6525 | 6619 | 6661 | 6736 | | | | |
| | | | 6674 | 6707 | 6736 | | | | | |
| | | | 6681 | 6742 | 6804 | | | | | |
| | | | 6707 | | | | | | | |
| | | | 6709 | | | | | | | |
| | | | 6741 | | | | | | | |
| | | | 6815 | | | | | | | |



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## METAL MINING

### MODE OF OCCURRENCE

| Surface | | Underground | | | | |
|---|---|---|---|---|---|---|
| | | | | Vein | | |
| Massive | Placer | Massive | Bedded | Wide | Narrow | Unconsolidated |
| 6234-2 | 6611 | 6092-2 | 6113-2 | 6145-2 | 6284-3 | 6612-3 |
| 6248-3 | 6659 | 6107-3 | 6121-2 | 6186-3 | 6377-3 | |
| 6325-2 | 6660 | 6149-2 | 6138-2 | 6232-2 | 6413-3 | |
| 6412-4 | 6786 | 6150-3 | 6159-1 | 6237-2 | 6416-2 | |
| 6462-2 | 6787 | 6160-3 | 6170-2 | 6238-2 | 6447-1 | |
| 6479-2 | 6788 | 6167-3 | 6174-2 | 6240-2 | 6467-1 | |
| 6666-2 | | 6168-4 | 6180-2 | 6260-2 | 6470-2 | |
| | | 6169-2 | 6254-6 | 6276-3 | 6512-3 | |
| | | 6179-2 | 6284-3 | 6290-3 | 6514-3 | |
| | | 6239-2 | 6290-2 | 6311-3 | 6525-2 | |
| | | 6247-3 | 6360-5 | 6322-2 | 6532-2 | |
| | | 6250-1 | 6361-4 | 6327-2 | 6543-2 | |
| | | 6286-1 | 6369-4 | 6360-5 | 6673-3 | |
| | | 6289-3 | 6380-2 | 6361-4 | 6674-1 | |
| | | 6307-5 | 6526-3 | 6368-2 | 6681-5 | |
| | | 6325-2 | 6656-2 | 6370-2 | 6707-5 | |
| | | 6348-2 | 6662-2 | 6371-3 | 6709-2 | |
| | | 6369-4 | | 6372-2 | 6735-3 | |
| | | 6397-2 | | 6390-2 | 6741-5 | |
| | | 6402-2 | | 6407-2 | 6799-2 | |
| | | 6440-2 | | 6464-2 | | |
| | | 6462-2 | | 6476-1 | | |
| | | 6525-2 | | 6490-2 | | |
| | | 6565-2 | | 6515-2 | | |
| | | 6574-2 | | 6525-2 | | |
| | | 6586-3 | | 6526-4 | | |
| | | 6588-2 | | 6601-4 | | |
| | | 6591-4 | | 6815-3 | | |
| | | 6661-4 | | 6823-2 | | |
| | | 6662-2 | | 6824-2 | | |
| | | 6736-2 | | | | |
| | | 6741-5 | | | | |
| | | 6776-2 | | | | |
| | | 6804-3 | | | | |
| | | 6806-3 | | | | |
| | | 6815-3 | | | | |



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METAL MINING - Continued

PROSPECTING

| Geophysical | | Test pits and trenching | Sounding bar and pipe | Panning | Drifts and crosscuts |
|---|---|---|---|---|---|
| Magnetic | Electric | | | | |
| 6092-2 | 6092-2 | 6238-3 | 6786-33 | 6611-5 | 6232-4 |
| 6180-3 | 6260-3 | 6276-3 | | 6786-34 | 6234-3 |
| 6260-3 | 6368-3 | 6325-3 | | 6799-2 | 6237-3 |
| 6361-6 | 6514-4 | 6397-3 | | | 6240-2 |
| | 6515-3 | 6416-3 | | | 6247-3 |
| | 6586-7 | 6512-3 | | | 6260-3 |
| | 6786-41 | 6515-3 | | | 6276-3 |
| | 6815-4 | 6525-3 | | | 6284-3 |
| | | 6543-3 | | | 6289-4 |
| | | 6666-5 | | | 6290-3 |
| | | 6673-4 | | | 6307-6 |
| | | 6681-5 | | | 6311-3 |
| | | 6693-8 | | | 6322-2 |
| | | 6707-6 | | | 6327-3 |
| | | 6735-3 | | | 6348-3 |
| | | 6786-39 | | | 6360-5 |
| | | 6800-3 | | | 6368-3 |
| | | | | | 6369-6 |
| | | | | | 6370-2 |
| | | | | | 6371-3 |
| | | | | | 6372-3 |
| | | | | | 6377-3 |
| | | | | | 6402-3 |
| | | | | | 6416-3 |
| | | | | | 6440-4 |
| | | | | | 6462-3 |
| | | | | | 6464-3 |
| | | | | | 6470-2 |
| | | | | | 6490-3 |
| | | | | | 6512-4 |
| | | | | | 6514-3 |
| | | | | | 6515-3 |
| | | | | | 6565-2 |
| | | | | | 6586-5 |
| | | | | | 6662-3 |
| | | | | | 6709-4 |
| | | | | | 6741-6 |
| | | | | | 6786-28 |
| | | | | | 6800-4 |
| | | | | | 6804-6 |
| | | | | | 6806-3 |



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## METAL MINING - Continued

### PROSPECTING - Continued

| Drilling | | | | Sampling | | Estimating tonnage | |
|---|---|---|---|---|---|---|---|
| Churn | Core | | Deep hole | | | | |
| 6113-2 | 6092-2 | 6490-3 | 6145-3 | 6107-5 | 6390-3 | 6107-5 | 6464-3 |
| 6121-2 | 6107-5 | 6512-4 | 6149-3 | 6138-4 | 6397-3 | 6113-2 | 6470-2 |
| 6150-3 | 6138-3 | 6515-3 | 6150-3 | 6145-6 | 6402-3 | 6138-4 | 6490-3 |
| 6151-4 | 6145-3 | 6525-3 | 6167-5 | 6149-3 | 6412-7-14 | 6145-4 | 6512-4 |
| 6152-3 | 6149-3 | 6543-3 | 6170-3 | 6150-4 | 6413-5 | 6149-3 | 6514-4 |
| 6159-2 | 6151-4 | 6586-6 | 6180-3 | 6159-2 | 6416-3 | 6150-4 | 6515-3 |
| 6167-5 | 6156-1 | 6601-6 | 6238-3 | 6160-5 | 6440-5 | 6159-3 | 6525-4 |
| 6169-3 | 6160-4 | 6602-2 | 6247-5 | 6167-6 | 6462-2 | 6160-5 | 6526-15 |
| 6174-2 | 6167-5 | 6662-3 | 6290-3 | 6168-5 | 6464-3 | 6167-6 | 6543-3 |
| 6234-3 | 6170-3 | 6673-4 | 6361-5 | 6169-3 | 6470-2 | 6168-5 | 6565-2 |
| 6239-2 | 6179-4 | 6679-1 | 6368-3 | 6179-4 | 6490-3 | 6169-3 | 6586-8 |
| 6247-3 | 6180-3 | 6681-5 | 6370-2 | 6180-4 | 6512-4 | 6170-6 | 6601-8 |
| 6286-2 | 6234-3 | 6693-8 | 6372-3 | 6186-4 | 6514-4 | 6174-4 | 6656-4 |
| 6290-3 | 6238-3 | 6707-7 | 6462-3 | 6232-4 | 6515-3 | 6180-4 | 6659-3 |
| 6325-3 | 6239-2 | 6708-1 | 6464-3 | 6234-4 | 6525-3 | 6232-5 | 6660-4 |
| 6348-3 | 6247-4 | 6709-4 | 6490-3 | 6237-3 | 6526-14 | 6234-5 | 6661-8 |
| 6360-5 | 6260-3 | 6735-3 | 6512-4 | 6238-4 | 6543-3 | 6237-4 | 6662-3 |
| 6412-6 | 6277-2 | 6736-2 | 6586-6 | 6239-3 | 6565-2 | 6238-4 | 6666-6 |
| 6591-7 | 6289-3 | 6741-6 | 6594-1 | 6247-5 | 6585-7 | 6247-6 | 6709-5 |
| 6612-5 | 6290-3 | 6804-7 | 6615-4 | 6248-27 | 6594-2-9 | 6260-3 | 6741-7 |
| 6656-4 | 6307-6 | 6815-4-5 | 6673-5 | 6260-3 | 6601-8 | 6286-2 | 6748-4-9 |
| 6659-3 | 6322-2 | | 6776-10 | 6276-3 | 6656-4 | 6289-4 | 6776-11 |
| 6660-3-4 | 6325-3 | | | 6284-4 | 6659-3 | 6290-4 | 6804-12 |
| 6666-4 | 6348-3 | | | 6286-2 | 6660-4 | 6307-6 | 6806-4 |
| 6776-9 | 6360-5 | | | 6289-4 | 6661-8 | 6311-3 | 6815-3 |
| 6786-33-37 | 6361-5 | | | 6290-4 | 6662-3 | 6322-3 | |
| | 6368-3-17 | | | 6307-6 | 6666-5 | 6325-3 | |
| | 6369-6 | | | 6311-3 | 6709-4 | 6327-3 | |
| | 6370-2 | | | 6322-3 | 6741-6 | 6348-3 | |
| | 6371-3 | | | 6325-3 | 6748-4-5 | 6360-6 | |
| | 6372-3 | | | 6327-3 | 6776-10-11 | 6361-7 | |
| | 6378-2 | | | 6348-3 | 6786-26-40-46 | 6368-4 | |
| | 6380-2 | | | 6360-6 | 6804-10 | 6370-3 | |
| | 6390-2 | | | 6361-7 | 6806-3 | 6377-4 | |
| | 6397-3 | | | 6368-3 | 6815-3 | 6380-3 | |
| | 6402-3 | | | 6369-6 | | 6390-3 | |
| | 6413-4 | | | 6370-3 | | 6402-3 | |
| | 6440-4 | | | 6372-3 | | 6412-9 | |
| | 6464-3 | | | 6377-4 | | 6413-5 | |
| | 6470-2 | | | 6380-2 | | 6440-7 | |



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## METAL MINING - Continued

### DEVELOPMENT

#### Surface

| Type of deposit | Bank | Dry pit | Wet pit | Subaqueous |
|---|---|---|---|---|
| | 6234-8<br>6666-8 | 6234-8<br>6248-3<br>6412-14<br>6462-5<br>6666-7 | 6659-1 | 6660-1<br>6788-48 |
| Stripping | 6234-8<br>6666-9 | 6234-8<br>6248-5-16<br>6412-15<br>6462-5 | 6659-10 | |
| Benches | 6234-9-10<br>6666-8-10-11 | 6248-5<br>6412-15<br>6462-5 | | |
| Haulage | | 6248-5<br>6462-6 | | |
| Drainage | | 6412-16 | | |



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METAL MINING - Continued

DEVELOPMENT - Continued

Underground

| Shafts | | | Adits | Drifts and crosscuts | | Raises | |
|---|---|---|---|---|---|---|---|
| Vertical | | Inclined | | | | | |
| 6107-6-12 | 6416-3-4 | 6092-3 | 6107-6 | 6092-4 | 6371-4 | 6107-11 | 6462-5 |
| 6113-3 | 6440-9 | 6149-3 | 6232-5 | 6107-9 | 6372-3 | 6113-5 | 6464-6 |
| 6121-3 | 6464-4 | 6167-7 | 6238-4 | 6113-4 | 6377-6 | 6138-6 | 6490-6 |
| 6138-5 | 6470-2 | 6169-6 | 6240-2 | 6121-5 | 6390-3 | 6149-6 | 6512-6 |
| 6145-4-5 | 6490-4 | 6170-7 | 6250-3 | 6138-5 | 6397-5 | 6150-5 | 6514-6 |
| 6149-3 | 6525-4 | 6284-4 | 6260-4 | 6145-6 | 6402-4 | 6160-8 | 6515-6 |
| 6150-4 | 6526-9 | 6311-4 | 6276-4 | 6149-4 | 6407-3 | 6167-9 | 6525-6 |
| 6159-4 | 6565-3-6 | 6327-4 | 6290-4 | 6150-5 | 6413-7 | 6168-15 | 6543-5 |
| 6160-6 | 6586-8-9 | 6360-7 | 6307-8 | 6159-4 | 6416-4 | 6169-7-16 | 6565-4 |
| 6167-7 | 6588-1 | 6369-7 | 6327-4 | 6160-8 | 6440-12-13 | 6180-5 | 6586-11 |
| 6168-5-8 | 6591-9 | 6372-3 | 6361-8 | 6167-8 | 6462-4 | 6232-9 | 6601-15 |
| 6170-7 | 6612-6 | 6407-2 | 6368-4 | 6168-13 | 6464-5 | 6237-6 | 6656-6 |
| 6174-3 | 6656-6 | 6462-4 | 6402-4 | 6169-7 | 6490-5 | 6238-6 | 6662-4 |
| 6179-5 | 6661-11 | 6464-4 | 6407-2 | 6170-8 | 6512-6 | 6240-3 | 6673-6 |
| 6180-4 | 6674-1 | 6512-5 | 6413-6 | 6174-4 | 6514-5 | 6247-8-16 | 6691-18 |
| 6232-5-7 | 6681-9 | 6515-3-4 | 6416-3 | 6179-6 | 6515-5 | 6248-20 | 6709-7 |
| 6237-4 | 6691-17 | 6526-9 | 6440-9 | 6180-5 | 6525-5 | 6250-7 | 6736-4 |
| 6238-4 | 6707-15 | 6543-4 | 6462-4 | 6186-10 | 6526-10 | 6260-8 | 6741-10 |
| 6239-3 | 6709-5 | 6565-3 | 6514-5 | 6232-8 | 6543-5 | 6276-5 | 6800-5 |
| 6247-6-8 | 6736-4 | 6586-8 | 6543-4 | 6237-5 | 6565-4 | 6284-6 | 6804-15 |
| 6254-7 | 6741-2-8 | 6601-9-12 | 6565-3 | 6238-6 | 6586-10 | 6289-5 | 6815-10 |
| 6250-3-4 | 6776-12 | 6662-3 | 6604-3 | 6240-3 | 6601-13 | 6290-4 | 6823-3 |
| 6260-4 | 6788-65 | 6673-5 | 6661-10 | 6247-7-15 | 6612-8 | 6307-17 | 6824-4 |
| 6286-3 | 6800-4 | 6691-17 | 6662-3 | 6250-5 | 6656-6 | 6311-6 | |
| 6289-4 | 6804-14 | 6735-4 | 6736-3 | 6254-8 | 6673-6 | 6322-4 | |
| 6290-4 | 6806-4 | 6776-12 | 6788-64 | 6260-6 | 6681-10 | 6327-5 | |
| 6307-8 | 6815-7-8 | 6799-2 | 6799-4 | 6284-5 | 6691-17 | 6348-8 | |
| 6322-3 | 6824-2 | 6800-4 | 6815-6-11 | 6286-3 | 6707-19 | 6350-16 | |
| 6325-4 | | | 6823-3 | 6289-5 | 6709-7 | 6360-8 | |
| 6348-4-5 | | | | 6290-4 | 6736-4 | 6361-9 | |
| 6360-7 | | | | 6307-16 | 6741-6-9 | 6368-6 | |
| 6368-4-5 | | | | 6311-6 | 6776-13 | 6370-6 | |
| 6369-7 | | | | 6322-4 | 6788-66 | 6371-4 | |
| 6370-3 | | | | 6325-4 | 6800-5 | 6372-4 | |
| 6371-4 | | | | 6327-5 | 6804-15 | 6377-6 | |
| 6377-4-5 | | | | 6348-6 | 6815-11 | 6397-5 | |
| 6380-3 | | | | 6350-16 | 6823-4 | 6402-4 | |
| 6390-3 | | | | 6360-7 | 6824-3 | 6413-7 | |
| 6397-4 | | | | 6368-6 | | 6416-5 | |
| 6413-6-8 | | | | 6370-4 | | 6440-13 | |



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## METAL MINING - Continued

### MINING METHODS

### Surface

| Bottom bench | | Top bench | | Placer | | | |
|---|---|---|---|---|---|---|---|
| Dry | Hydraulic | Dry | Dredging | Hand shoveling | Ground sluicing | Hydraulicking | Dredging |
| 6234-10 | 6611-13 | 6788-5 | 6357-3-7 | 6786-47 | 6786-58 | 6659-10 | 6659-4 |
| 6248-4-20 | | | 6611-14 | | | 6787-3 | 6660-5-7 |
| 6412-15 | | | 6659-4 | | | | 6788-46 |
| 6429-1 | | | 6660-7 | | | | |
| 6462-7 | | | 6788-46 | | | | |
| 6479-2 | | | | | | | |
| 6503-5-30 | | | | | | | |
| 6532-4 | | | | Drifting | Slip scraper | Tractor scraper | Power scraper |
| 6788-5 | | | | 6612-1 | 6788-5-7 | 6788-5-7 | 6788-5-7 |
| | | | | 6788-63-68 | -15 | -16 | -22 |
| Glory hole | | | | | | | |
| 6248-4-18 | | | | Slackline cableway | Dragline | Power shovel | |
| 6411-1 | | | | 6788-5-7 | 6788-5-6 | 6532-4 | |
| 6462-5 | | | | -18-24 | -7-25 | 6788-5-6 | |
| 6659-10 | | | | | | -7-25 | |
| 6661-10-13 | | | | | | | |



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## METAL MINING - Continued

### MINING METHODS - Continued

#### Underground

| Open stopes | Sub-level stopes | Shrinkage | Cut-and-fill | Square set | Caving | Top slicing | Pillar support |
|---|---|---|---|---|---|---|---|
| 6092-6 | 6149-7 | 6186-6 | 6145-2-7 | 6169-11 | 6107-17-24 | 6179-7 | 6092-7 |
| 6113-6 | 6402-5 | 6237-7-13 | 6168-16-17 | 6237-7-13 | 6167-1 | 6237-7-14 | 6121-6 |
| 6121-5 | 6515-7 | 6240-4 | 6232-11 | 6247-19-21 | 6169-10 | 6247-19-26 | 6150-6 |
| 6138-7 | | 6247-19-20 | 6238-7 | 6250-7 | 6186-7 | 6325-6 | 6170-14 |
| 6150-6 | | 6260-10 | 6247-19-23 | 6290-6 | 6247-19-28 | 6380-4 | 6174-5 |
| 6159-5 | | 6276-5 | 6254-12 | 6307-23 | 6348-8 | 6410-1 | 6254-6 -9 |
| 6160-7 | | 6284-8 | 6289-6 | 6311-7 | 6350-1 | 6440-18 | 6260-10 |
| 6170-12 | | 6289-10 | 6290-8 | 6322-5 | 6369-7-16 | 6467-1 | 6286-3 |
| 6174-4 | | 6293-1 | 6307-19 | 6360-8 | 6467-1 | 6503-5-25 | 6327-7 |
| 6180-5 | | 6307-23 | 6311-7 | 6368-8 | 6503-5-22 -28 | 6661-20 | 6390-4 |
| 6193-1 | | 6322-5 | 6322-5 | 6370-6 | 6565-7 | | 6397-4 |
| 6237-7-15 | | 6327-7-9 | 6368-8 | 6372-4 | 6661-19 | | 6413-13 |
| 6239-3 | | 6390-4 | 6377-7 | 6377-7 | 6815-17 | | 6470-3 |
| 6286-3 | | 6402-6 | 6407-3 | 6407-4 | | | 6515-9 -10 |
| 6361-11 | | 6413-11-12 | 6413-11-17 | 6440-14 | | | 6543-6 |
| 6369-7-17 | | 6433-1 | 6416-7 | 6462-8 | | | 6651-1 |
| 6371-5 | Drift mining | 6440-17 | 6440-14 | 6467-1 | | | 6662-5 |
| 6397-5 | 6612-9 | 6464-6-7 | 6447-1 | 6476-1 | | | 6688-32 |
| 6462-8 | | 6470-3 | 6464-6-9 | 6503-5-19 | | | 6691-61 |
| 6503-5-9 | | 6490-6 | 6490-6 | 6512-7 | | | 6804-22 |
| 6514-3-11 | | 6503-5-12 | 6503-5-16 | 6691-1 | | | |
| 6526-12 | | 6525-6 | 6514-8 | 6741-10 | | | |
| 6574-2 | | 6543-6 | 6515-6 | 6815-14 | | | |
| 6586-12 | | 6574-2 | 6543-6-7 | | | | |
| 6656-6 | | 6586-14 | 6673-6 | | | | |
| 6661-21 | | 6601-16 | 6688-1 | | | | |
| 6662-5 | | 6604-3 | 6736-5 | | | | |
| 6709-8 | | 6741-11 | 6741-10 | | | | |
| 6735-5 | | 6800-13 | 6800-10 | | | | |
| 6736-5 | | 6806-5 | 6815-14 | | | | |
| 6799-3 | | 6815-15 | 6823-4 | | | | |
| 6800-11 | | | | | | | |
| 6804-20 | | | | | | | |
| 6824-3 | | | | | | | |



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## METAL MINING - Continued

### MINING METHODS - Continued

#### Drilling

| Primary | | | | | | Secondary | |
|---|---|---|---|---|---|---|---|
| | | | | Churn drill | Coyote | | Bulldozing chambers |
| 6092-6-7 -11-12 | 6239-5 | 6380-6 | 6661-15 | 6248-9-24 -31 | 6186-7 | 6092-6 | 6186-8 |
| 6113-6 | 6240-5 | 6397-6 | 6662-6 | 6412-17 | 6234-12 | 6121-5 | 6240-4 |
| 6121-6 | 6248-7-9 -24-31 | 6402-6 | 6668-10 | 6666-8 | 6248-8-11 | 6160-10 | 6322-5 |
| 6138-8 | 6260-10-16 | 6412-17 | 6674-5 | | 6666-8 | 6174-4 | 6350-18-19 |
| 6145-7 | 6284-8 | 6416-8 | 6688-21 | | | 6240-5 | 6361-11 |
| 6149-10 | 6286-4 | 6462-9 | 6691-24 | | | 6289-9 | 6402-6 |
| 6150-6 | 6289-9 | 6490-6 | 6709-9 | | | 6322-6 | 6412-16 |
| 6159-5 | 6311-9 | 6512-8 | 6741-11 | | | 6412-16 | 6464-9 |
| 6160-10 | 6325-7 | 6514-9 | 6799-4 | | | 6464-7 | 6661-16 |
| 6170-8 | 6327-8 | 6526-17 | 6800-12 | | | 6543-6 | 6662-7 |
| 6174-5 | 6348-9 | 6543-6 | 6804-15-21 | | | 6586-15 | 6804-24 |
| 6179-7 | 6361-10 | 6565-7 | 6806-5 | | | 6661-16 | |
| 6186-7 | 6368-7 | 6586-17 | 6815-17 | | | 6688-32 | |
| 6232-13 | 6369-10-16 | 6588-4 | 6823-4 | | | 6804-24 | |
| 6234-12 | 6377-8 | 6656-7 | | | | | |

#### Blasting

| Primary | | | | | | Secondary |
|---|---|---|---|---|---|---|
| 6092-6 | 6174-5 | 6289-10 | 6412-19 | 6601-16-19 | 6799-4 | 6186-8 |
| 6113-7 | 6179-7 | 6311-9 | 6416-8 | 6656-7 | 6804-18-21 | 6412-20 |
| 6121-7 | 6186-8-9 | 6325-7 | 6462-9 | 6661-15 | 6806-5 | 6815-16 |
| 6145-7 | 6232-12-13 | 6327-8 | 6464-9 | 6666-11 | 6815-18 | |
| 6150-6 | 6239-5 | 6368-7 | 6490-6 | 6674-6 | 6823-4 | |
| 6159-5 | 6248-7-11 | 6369-12 | 6514-9 | 6688-31 | | |
| 6160-10 | 6260-10-12 | 6370-4-5 | 6526-18 | 6691-24 | | |
| 6170-8 | 6284-8 | 6377-8 | 6588-5 | 6709-9 | | |

#### Timbering

| | | | | | |
|---|---|---|---|---|---|
| 6150-8 | 6290-6-7 | 6369-12-15 | 6464-7 | 6525-7 | 6674-7 |
| 6167-9 | 6311-4-9 | 6370-4-5-7 | 6470-2-3 | 6526-12 | 6691-9-28 |
| 6232-13 | 6322-4-5 | 6371-5 | 6490-5-6 | 6588-6-11 | 6738-66 |
| 6247-16 | 6325-6-8 | 6372-3-4 | 6512-5-7-9 | 6651-10-14-17 | 6797-1 |
| 6250-6-8 | 6360-12 | 6407-4 | 6514-6-11 | 6673-7 | 6800-13 |
| 6289-8 | 6361-8 | | | | |



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## METAL MINING - Continued

### MINING METHODS - Continued

### Loading

#### Surface

| Hand | Tractor | Power shovel | | Scraper | Dragline | Ladder dredge | Pump dredge |
|---|---|---|---|---|---|---|---|
| 6611-7 | 6788-5-7 -16 | 6234-14 | 6479-2 | 6611-13 | 6241-17 | 6659-8 | 6357-3-7 |
| | | 6248-14-20 | 6532-4 | 6241-17 | 6429-4 | 6660-5 | |
| | | 6412-21 | 6787-48 | 6788-5-7 -22 | 6786-70 | 6788-48-56 -57 | Slackline |
| Team | | 6429-1 | 6788-5-6 -7-25 | | 6787-39 | | |
| 6788-5-7 -15 | | 6462-7 | | | 6788-5-6 -7-25 | | 6788-5-7 -18-24 |
| | | 6666-13 | | | | | |

#### Underground

| Hand | Chutes | | | | | Power shovels | Scraper |
|---|---|---|---|---|---|---|---|
| 6092-8 | 6092-9 | 6250-7 | 6350-19-27 -30 | 6512-8 | 6804-25 | 6092-8 | 6092-8 |
| 6113-8 | 6107-22 | 6260-17 | | 6514-9 | 6806-6 | 6159-5 | 6138-9-10 |
| 6121-8 | 6138-9-11 | 6276-5 | 6368-10 | 6515-11 | 6815-22 | 6160-11 | 6239-6 |
| 6138-9 | 6145-10 | 6284-9 | 6369-18 | 6525-7 | | 6170-14 | 6815-23 |
| 6150-7 | 6167-17 | 6289-10 | 6371-6 | 6543-7 | | 6656-8 | |
| 6159-5 | 6169-13 | 6290-7 | 6377-8 | 6586-18 | | 6815-23 | |
| 6170-13 | 6179-7 | 6307-22 | 6397-6 | 6601-21 | | | |
| 6174-7 | 6180-6 | 6311-8 | 6402-6 | 6661-16 | | | |
| 6239-6 | 6186-8 | 6322-5-6 | 6407-3 | 6662-5 | | | |
| 6286-4 | 6232-14 | 6325-8 | 6416-9 | 6673-8 | | | |
| 6397-6 | 6238-8 | 6326-17 | 6464-10 | 6688-37 | | | |
| 6588-5 | 6239-6 | 6327-8 | 6470-3 | 6691-26 | | | |
| 6656-8 | 6240-5 | 6348-8 | 6490-7 | 6709-9 | | | |
| 6674-7 | 6247-30 | 6361-11-14 | 6495-1 | 6800-10-12 | | | |



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## METAL MINING - Continued

### MINING METHODS - Continued

#### Hauling

##### Surface

| Locomotive | | | Hoist and cable | Auto truck | | Aerial tram | |
|---|---|---|---|---|---|---|---|
| Trolley | Gasoline | Steam | | | | | |
| 6234-17 | 6586-20 | 6358-11 | 6476-3 | 6248-20-22 | 6621-2 | 6276-6 | 6544-9 |
| 6319-4 | 6656-13 | 6412-23 | 6662-7 | 6429-1 | 6685-5 | 6285-5 | 6555-8 |
| 6479-3 | | 6479-3 | 6735-5 | 6430-1 | 6788-5-7 | 6368-11-18 | 6604-5 |
| 6555-4 | | 6666-14 | | 6462-7 | 6799-5 | 6371-8 | 6742-1 |
| 6804-31 | | 6788-5-7 | | 6489-7 | | 6379-3 | 6806-7 |
| 6815-20 | | | | 6497-2 | | 6416-11 | 6815-20 |
| | | | | 6514-12 | | 6447-1-3 | |
| | | | | 6532-4 | | 6462-9 | |
| | | | | 6543-9 | | 6514-12 | |
| | | | | 6551-4 | | 6543-7 | |

| Conveyor belt | Power scraper | Slackline | Tractor | Pipeline | Hydraulic elevator | Airplane |
|---|---|---|---|---|---|---|
| 6429-4 | 6788-5-7 | 6788-5-7 | 6681-2 | 6357-4 | 6788-6 | 6681-2 |
| 6462-5-7 | | | 6788-5-7 | | | 6707-4 |
| | | | | | | 6767-1 |



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## METAL MINING - Continued

### MINING METHODS - Continued

### Hauling - Continued

#### Underground

| Hand | Rope and- | | Locomotive | | | Hoisting | |
|---|---|---|---|---|---|---|---|
| | Car | Scraper | Trolley | Battery | Air | | |
| 6092-8 | 6121-8 | 6179-7 | 6092-8-9 | 6133-10 | 6167-20 | 6092-9 | 6390-4 |
| 6113-8 | 6159-6 | 6290-7-9 | 6107-25 | 6145-9 | 6169-13 | 6107-26 | 6407-6 |
| 6121-8 | 6326-15 | -10 | 6113-8 | 6149-11 | 6326-14 | 6121-2 | 6413-19 |
| 6170-17 | 6735-5 | 6326-19 | 6138-10 | 6168-24 | | 6149-3 | 6416-10-11 |
| 6174-7 | | 6348-9 | 6149-11 | 6186-9 | | 6150-5 | 6440-9-20 |
| 6247-29 | | 6369-10 | 6160-11 | 6232-14 | | 6160-11 | 6464-10 |
| 6284-9 | | 6371-5 | 6168-24 | 6237-16 | | 6167-20 | 6470-3 |
| 6286-4 | | 6372-4 | 6170-17 | 6238-8 | | 6168-23 | 6487-1 |
| 6311-10 | | 6440-13 | 6179-10 | 6240-5 | | 6169-17 | 6490-7 |
| 6322-6 | | 6515-5 | 6180-7 | 6247-29 | | 6180-7 | 6512-9 |
| 6325-8 | Animal | 6526-18 | 6186-9 | 6250-9 | | 6232-5-14 | 6515-4-11 |
| 6326-3 | | 6574-2 | 6237-16 | 6260-17 | | -15 | 6565-10 |
| 6327-10 | 6159-6 | 6586-14 | 6239-6 | 6289-12 | | 6237-16 | 6574-1 |
| 6360-13 | 6170-17 | 6662-5 | 6250-8 | 6307-27 | | 6238-8 | 6586-19 |
| 6377-8 | 6276-6 | 6688-35 | 6289-12 | 6326-14 | | 6239-7 | 6601-22 |
| 6413-19 | 6326-7 | 6736-5 | 6290-13 | 6361-14 | | 6240-6 | 6656-10 |
| 6440-19 | 6360-13 | 6804-20-22 | 6307-27 | 6368-11 | | 6247-32 | 6661-22 |
| 6464-10 | 6402-6 | 6815-23-24 | 6326-13 | 6370-9 | | 6260-17-18 | 6673-11 |
| 6470-3 | 6543-7 | | 6348-9 | 6372-5 | | 6384-9 | 6709-10 |
| 6490-7 | | | 6369-17 | 6416-10 | | 6286-5 | 6741-12 |
| 6512-9 | | | 6379-7 | 6440-19 | | 6289-12 | 6799-4 |
| 6514-11 | | | 6380-6 | 6462-9 | | 6290-14 | 6804-25-26 |
| 6525-7 | | | 6390-3 | 6464-10 | | 6307-10-26 | 6806-6 |
| 6543-7 | | | 6407-6 | 6512-9 | | 6311-10 | 6815-24 |
| 6565-9 | | | 6440-19-20 | 6526-18 | | 6322-6 | |
| 6586-18 | | | 6515-11 | 6586-18 | | 6325-8 | |
| 6656-9 | | | 6565-9 | 6661-22 | | 6326-23 | |
| 6662-7 | | | 6601-21 | 6709-10 | | 6327-10 | |
| 6673-11 | | | 6661-21 | 6804-25 | | 6348-10 | |
| 6688-35 | | | 6815-21-22 | 6823-5 | | 6360-13 | |
| 6709-10 | | | | | | 6368-11 | |
| 6736-6 | | | | | | 6369-8-19 | |
| 6741-12 | | | | | | 6370-10 | |
| 6799-4 | | | | | | 6371-7 | |
| 6806-6 | | | | | | 6372-5 | |
| 6823-5 | | | | | | 6377-9 | |



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## METAL MINING - Continued

### POWER

| Primary | | | | Secondary | | | |
|---|---|---|---|---|---|---|---|
| 6234-15 | 6656-10-11 | 6735-2 | 6823-3 | 6234-13 | 6361-9 | 6660-13 | 6806-8-14 |
| 6327-12 | 6659-13 | 6736-7 | 6824-1 | 6247-34 | 6514-7 | 6666-15 | 6824-3 |
| 6369-9 | 6660-12 | 6804-27 | | 6286-4 | 6543-8 | 6681-7 | |
| 6586-20 | 6666-15 | 6806-14 | | 6307-9 | 6565-3 | 6736-6 | |
| 6601-26 | 6681-7 | 6815-25 | | 6327-12 | 6586-17 | 6804-19 | |

### MINING EXTRACTION, PERCENT

| Surface | Underground | | | | | | |
|---|---|---|---|---|---|---|---|
| 6234-19 | 6113-9 | 6160-14 | 6186-10 | 6286-5 | 6360-14 | 6515-11 | 6804-28 |
| 6738-59 | 6121-9 | 6167-19 | 6232-16 | 6289-11 | 6368-13 | 6525-8 | 6815-25 |
| | 6138-11 | 6168-25 | 6238-9 | 6307-25 | 6377-9 | 6601-20 | |
| | 6145-10 | 6169-18 | 6240-6 | 6322-7 | 6402-7 | 6666-16 | |
| | 6149-12 | 6174-8 | 6260-18 | 6327-8 | 6413-16 | 6709-10 | |
| | 6159-6 | 6179-10 | 6284-10 | 6350-34 | 6490-7 | 6741-13 | |

### MINE DRAINAGE

| Surface | Underground | | | | | | |
|---|---|---|---|---|---|---|---|
| 6412-25 | 6092-9 | 6167-22 | 6290-16 | 6407-6 | 6543-8 | 6656-11 | 6806-7 |
| 6666-15 | 6107-27 | 6174-7 | 6311-12 | 6413-19 | 6565-11 | 6673-12 | 6815-26 |
| | 6113-8 | 6234-19 | 6368-12 | 6440-30 | 6586-15-20 | 6674-7 | |
| | 6121-8 | 6237-16 | 6369-15 | 6514-14 | 6588-7 | 6735-5 | |
| | 6150-8 | 6239-9 | 6372-5 | 6515-11 | 6601-25 | 6736-6 | |
| | 6160-13 | 6247-34 | 6377-10 | 6526-18 | 6612-10 | 6741-17 | |

### MINE VENTILATION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6107-26 | 6169-20 | 6247-35 | 6322-8 | 6377-10 | 6490-8 | 6601-25 | 6736-6 |
| 6113-10 | 6174-9 | 6250-9 | 6325-9 | 6380-7 | 6512-8-10 | 6656-11 | 6741-14 |
| 6121-10 | 6179-10 | 6260-19 | 6327-12 | 6382-1 | 6514-14 | 6661-25 | 6804-29 |
| 6138-11 | 6180-8 | 6276-7 | 6348-10 | 6390-5 | 6515-12 | 6662-8 | 6806-7 |
| 6145-10 | 6186-16 | 6284-11 | 6360-15 | 6402-8 | 6525-9 | 6663-1 | 6815-30 |
| 6150-8 | 6232-18 | 6286-6 | 6368-14 | 6407-7 | 6526-16 | 6673-12 | 6823-5 |
| 6159-7 | 6237-18 | 6289-12 | 6369-12- | 6413-20 | 6543-8 | 6674-5 | |
| 6160-17 | 6238-10 | 6290-17 | -20 | 6440-25 | 6565-11 | 6688-53 | |
| 6167-22 | 6239-8 | 6307-29 | 6370-11 | 6464-11 | 6585-1 | 6709-11 | |
| 6168-26 | 6240-6 | 6311-11 | 6371-9 | 6470-4 | 6586-20 | 6735-5 | |
| | | | 6372-5 | | | | |



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## METAL MINING - Continued

### MINE MISCELLANEOUS

| Level spacing | Accounts | Shops | | | | Camps |
|---|---|---|---|---|---|---|
| 6613-1 | 6622-1<br>6623-1 | 6234-19<br>6405-15<br>6421-14<br>6448-11<br>6514-7 | 6531-12-13<br>6580-13<br>6581-8<br>6607-16<br>6609-10 | 6621-13<br>6656-12<br>6660-11<br>6666-15<br>6696-7 | 6705-4-5<br>6707-14 | 6707-10<br>6786-23 |

### WAGE - CONTRACT - BONUS

#### Surface

| | |
|---|---|
| 6234-19 | 6660-14 |
| 6248-32 | 6666-16 |
| 6659-14 | 6788-12-51 |

#### Underground

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6092-9-10 | 6160-15 | 6237-17 | 6286-6 | 6368-13 | 6413-22 | 6515-11 | 6709-11 |
| -11 | 6167-21 | 6238-9 | 6289-12 | 6369-20 | 6416-12 | 6525-8 | 6741-14 |
| 6107-27-28 | 6168-25 | 6239-7 | 6290-15 | 6370-12 | 6440-21 | 6565-10 | 6799-7 |
| 6113-9 | 6169-19 | 6240-6 | 6307-28 | 6371-8 | 6462-11 | 6586-21 | 6804-28 |
| 6121-9 | 6170-18 | 6247-37 | 6311-11 | 6377-9 | 6464-11 | 6601-23 | 6806-12 |
| 6145-11 | 6174-8 | 6250-9 | 6322-7 | 6380-7 | 6470-4 | 6650-6 | 6815-27 |
| 6149-13 | 6179-10 | 6260-18 | 6325-9 | 6397-7 | 6490-8 | 6656-10 | 6824-5 |
| 6150-8 | 6186-10 | 6276-6 | 6327-11 | 6402-8 | 6512-10 | 6661-23 | |
| 6159-6 | 6232-17 | 6284-10 | 6360-14 | 6412-26 | 6514-12 | 6662-8 | |

### SAFETY AND ACCIDENT PREVENTION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6107-29 | 6168-27 | 6239-9 | 6290-17 | 6370-11 | 6416-13 | 6525-9 | 6688-53 |
| 6113-10 | 6169-21 | 6240-7 | 6307-32 | 6372-6 | 6440-27-28 | 6543-8 | 6736-7 |
| 6145-13 | 6170-20 | 6247-36 | 6311-12 | 6377-11 | 6464-11 | 6565-11 | 6804-29 |
| 6149-14 | 6179-11 | 6250-10 | 6322-8 | 6380-7 | 6470-4 | 6586-25 | 6815-31 |
| 6150-8 | 6186-16 | 6260-19 | 6325-9 | 6390-5 | 6488-22 | 6601-25 | |
| 6152-17 | 6232-19 | 6276-7 | 6348-10 | 6402-8 | 6490-9 | 6624-21 | |
| 6159-7 | 6234-20 | 6277-8 | 6360-18 | 6407-7 | 6512-10 | 6656-11 | |
| 6160-17 | 6237-18 | 6286-7 | 6368-14 | 6412-25 | 6514-14 | 6661-25 | |
| 6167-23 | 6238-11 | 6289-13 | 6369-20 | 6413-23 | 6515-13 | 6662-8 | |

### PLANT ORGANIZATION

| | | | | | | |
|---|---|---|---|---|---|---|
| 6167-24 | 6247-37 | 6277-8 | 6378-8 | 6412-26 | 6586-25 | 6709-15 |
| 6168-30 | 6248-32 | 6322-9 | 6402-8 | 6440-30 | 6601-26 | 6806-8 |
| 6234-20 | 6260-19 | 6360-14 | 6404-30 | 6490-9 | 6650-1 | |



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## METAL MINING - Continued

### COSTS - DOLLARS

### Exploration

| General | Transportation | | | | | Camp | |
|---|---|---|---|---|---|---|---|
| | Roads | Snow tractor | Sleighs | Canoe | Airplane | | |
| 6554-2 | 6681-12 | 6693-4-5 | 6693-5 | 6693-6 | 6693-5-20 | 6681-6-7 | 6707-6-7 |
| 6681-12 | 6693-8-19 | -6 | 6707-4 | | 6707-5 | -12 | -10-11 |
| 6693-9-19 | -20-22 | | | | 6767-23-24 | 6693-6-7 | -12-13 |
| -20-22 | 6735-7 | | | | | -8-19 | 6735-7 |
| -23-24 | | | | | | -20-22 | |
| 6786-29 | | | | | | -23-24 | |
| 6788-52 | | | | | | | |

### Prospecting

| Unit per acre | Drilling | | | | Test pits | Geo-physical | Placer panning |
|---|---|---|---|---|---|---|---|
| | Churn | Core | Deep hole | Empire | | | |
| 6591-9 | 6591-16-17 | 6368-17-19 | 6368-19 | 6786-33 | 6668-24 | 6786-46 | 6786-48 |
| 6786-31-46 | 6776-9-10 | 6525-10 | 6594-27-28 | | 6786-28-29 | | |
| | 6786-35-37 | 6594-30 | -29-30 | | -32 | | |
| Per ton | -38 | 6693-9-10 | 6615-4 | | | | Rocker |
| 6250-11 | | -20-22 | | | | | 6786-49 |
| 6368-17 | | -24 | | | Shafts | | -50 |
| | | 6707-8 | | | 6786-30-31 | | |
| | | 6708-15 | | | -33-35 | | Long tom |
| | | 6804-34 | | | 6800-7 | | 6786-51 |

### Development

| Stripping | | Surface | | | | | |
|---|---|---|---|---|---|---|---|
| Super-vision | Labor | Compressed air | Explosives | Supplies | Repairs | Power | Fuel |
| 6234-22 | 6234-22 | 6234-22 | 6234-22 | 6234-22 | 6234-22 | 6234-22 | 6234-22 |
| | 6405-23 | 6412-27-28 | 6412-27-28 | 6405-23 | 6405-23 | 6412-27-28 | 6412-27 |
| | 6412-27-28 | | 6462-12-14 | 6412-27-28 | 6412-27-28 | 6503-32 | -28 |
| | 6462-12-14 | | | 6462-12-14 | | | |
| | 6503-32 | | | 6503-32 | | | |

| Breaking | Loading | Hauling | Track | Auto truck | Miscel. | Dump |
|---|---|---|---|---|---|---|
| 6234-22 | 6234-22 | 6234-22 | 6234-22 | 6248-31 | 6234-22 | 6248-31 |
| 6248-31 | 6248-31 | 6412-27-28 | 6412-27-28 | | 6248-31 | |
| 6412-27-28 | 6412-27-28 | 6503-32 | | | 6503-32 | |
| 6503-32 | 6503-32 | | | | | |



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METAL MINING - Continued

COSTS - DOLLARS - Continued

Development - Continued

Underground

| Labor | Super-vision | Comp. air drills, steel | Power | Explo-sives | Timber | Other supplies |
|---|---|---|---|---|---|---|
| 6092-11 | 6092-11 | 6092-11 | 6145-15 | 6092-11 | 6107-31 | 6092-11 |
| 6107-31 | 6138-12 | 6138-12 | 6168-31 | 6107-31 | 6138-12 | 6138-12 |
| 6138-12 | 6145-15 | 6145-15 | 6179-12-13 | 6138-12 | 6145-15 | 6145-15 |
| 6145-15 | 6168-31 | 6149-15 | 6186-17 | 6145-15 | 6167-26-27 | 6169-23 |
| 6149-15 | 6169-23 | 6168-31 | 6238-11 | 6149-15 | 6168-31 | 6179-12-13 |
| 6167-26-27 | 6179-12-13 | 6169-23 | 6239-11 | 6167-26 | 6169-23 | 6180-9 |
| 6168-31 | 6180-9 | 6179-12-13 | 6240-8 | 6168-31 | 6179-12-13 | 6186-17 |
| 6169-23 | 6232-20 | 6180-9 | 6247-40 | 6169-23 | 6180-9 | 6232-20 |
| 6179-12-13 | 6240-8 | 6238-11 | 6260-20 | 6174-8 | 6238-11 | 6239-11 |
| 6180-9 | 6247-40 | 6239-11 | 6284-11 | 6179-12-13 | 6240-8 | 6240-8 |
| 6181-21 | 6260-20 | 6240-8 | 6290-17 | 6180-9 | 6247-40 | 6247-40 |
| 6186-17 | 6284-11 | 6247-40 | 6307-34 | 6181-21 | 6260-20 | 6260-20 |
| 6232-20 | 6290-17 | 6260-20 | 6311-13 | 6186-17 | 6284-11 | 6284-11 |
| 6238-11 | 6307-34 | 6284-11 | 6322-9 | 6238-11 | 6290-17-18 | 6290-17 |
| 6239-11 | 6322-9 | 6290-17-18 | 6327-12-15 | 6239-11 | 6307-34 | 6311-13 |
| 6240-8 | 6327-12 | 6307-34 | 6360-20 | 6240-8 | 6311-13 | 6322-9 |
| 6247-40 | 6348-11 | 6322-9 | 6368-17 | 6247-40 | 6322-9 | 6327-12-15 |
| 6260-20 | 6360-20 | 6327-12 | 6371-10 | 6260-20 | 6327-12 | 6348-11 |
| 6284-11 | 6369-24 | 6348-11 | 6372-6 | 6277-6 | 6360-20 | 6360-20 |
| 6290-17-18 | 6371-10 | 6360-20 | 6377-12 | 6284-11 | 6368-17 | 6368-17-19 |
| 6307-34 | 6377-12 | 6369-24 | 6399-6 | 6290-17-18 | 6371-10 | 6369-24 |
| 6311-13 | 6380-8 | 6371-10 | 6407-8 | 6307-34 | 6372-6 | 6371-10 |
| 6322-9 | 6390-6 | 6372-6 | 6462-14 | 6311-13 | 6377-12 | 6377-12 |
| 6327-12-15 | 6397-8 | 6377-12 | 6480-7 | 6322-9 | 6380-8 | 6380-8 |
| 6348-11 | 6470-5 | 6380-8 | 6543-12 | 6327-12-15 | 6390-6 | 6390-6 |
| 6360-20 | 6490-10 | 6390-6 | 6588-12 | 6348-11 | 6407-8 | 6399-6 |
| 6368-17-19 | 6514-14-15 | 6397-8 | 6598-4 | 6360-20 | 6413-23 | 6402-9 |
| 6369-24 | 6515-14 | 6402-9 | 6601-27-28 -31 | 6368-17 | 6464-14 | 6407-8 |
| 6371-10 | 6525-10 | 6413-23 | 6640-7 | 6369-24 | 6470-5 | 6413-23 |
| 6372-6 | 6543-12 | 6470-5 | 6661-29-30 | 6371-10 | 6490-10 | 6462-14 |
| 6377-12 | 6601-29 | 6480-7 | 6662-9 | 6372-6 | 6514-14-15 | 6470-5 |
| 6380-8 | 6640-7 | 6490-10 | 6673-14 | 6377-12 | 6515-14 | 6480-7 |
| 6390-6 | 6661-29-30 | 6515-14 | 6674-8 | 6380-8 | 6543-12 | 6490-10 |
| 6397-8 | 6662-9 | 6525-10 | 6735-4-9 | 6390-6 | 6565-12 | 6514-14-15 |
| 6399-6 | 6673-14 | 6543-12 | 6736-8-10 | 6397-8 | 6598-4 | 6525-10 |
| 6402-9 | 6674-8 | 6565-12 | 6741-17 | 6402-9 | 6601-29-31 | 6543-12 |
| 6407-8 | 6681-12 | 6601-29 | | 6407-8 | 6602-13 | 6565-12 |



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METAL MINING - Continued

COSTS - DOLLARS - Continued

Development - Continued

Underground - Continued

| Labor | Super-vision | Comp. air drills, steel | Power | Explo-sives | Timber | Other supplies |
|---|---|---|---|---|---|---|
| 6413-23 | 6709-12-14 | 6640-7 | 6804-34 | 6413-23 | 6661-29-30 | 6588-12 |
| 6462-14 | 6736-8 | 6662-9 | 6815-33-34 | 6462-14 | 6673-14 | 6601-29-31 |
| 6470-5 | 6741-17 | 6673-14 | 6823-6 | 6470-5 | 6674-8 | 6602-13 |
| 6480-7 | 6815-33-34 | 6674-8 | | 6480-7 | 6681-10-11 | 6661-29-30 |
| 6490-10 | | 6681-10-11 | | 6490-10 | 6707-18 | 6662-9 |
| 6514-14-15 | | 6709-12 | | 6514-14-15 | 6709-12-14 | 6673-14 |
| 6515-14 | | 6736-8 | | 6515-14 | 6736-8-11 | 6674-8 |
| 6525-10 | | 6741-17 | | 6525-10 | 6741-17 | 6681-10-11 |
| 6543-12 | | 6804-34 | | 6543-12 | 6804-34 | 6707-18-20 |
| 6565-12 | | 6815-33-34 | | 6565-12 | 6815-33-34 -35-36 | 6709-12 |
| 6588-12 | | 6824-8 | | 6588-12 | 6824-7 | 6735-4-9 |
| 6598-4 | | | | 6598-4 | | 6736-8-11 |
| 6601-29-31 | | | | 6601-29-31 | | 6741-17 |
| 6602-13 | | | | 6640-7 | | 6804-34 |
| 6661-29-30 | | | | 6661-29-30 | | 6815-33-34 -35-36 |
| 6662-9 | | | | 6662-9 | | 6823-6 |
| 6673-14 | | | | 6673-14 | | |
| 6674-8 | | | | 6674-8 | | |
| 6681-10-11 | | | | 6681-10-11 | | |
| 6707-17-18 -20 | | | | 6707-17-20 | | |
| 6709-12 | | | | 6709-12 | | |
| 6735-4-9 | | | | 6735-4 | | |
| 6736-8-11 | | | | 6736-8-11 | | |
| 6741-17 | | | | 6741-17 | | |
| 6804-34 | | | | 6804-34 | | |
| 6815-33-34 -35-36 | | | | 6815-33-34 -35-36 | | |
| 6823-6 | | | | | | |



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METAL MINING - Continued

COSTS - DOLLARS - Continued

Development - Continued

Underground - Continued

| Drifting, cross-cutting | Raising | Sinking | Breaking | Stope prepa-ration | Chutes | Assaying, sampling | Per ton |
|---|---|---|---|---|---|---|---|
| 6107-31 | 6107-31 | 6322-11 | 6601-31 | 6107-31 | 6107-31 | 6107-32 | 6543-12 |
| 6167-26-27 | 6167-26-27 | 6378-8 | 6640-7 | 6167-25-26 | 6167-26-27 | 6167-27 | 6691-71 |
| 6181-21 | 6543-12 | 6543-12 | 6674-8 | -27 | 6495-14-21 | 6543-12 | 6776-16 |
| 6290-18 | 6586-22 | 6586-22 | 6709-14 | 6601-29 | 6613-10-13 | | |
| 6480-7 | 6601-31 | 6588-12 | 6736-11 | 6691-71 | -16 | | |
| 6543-12 | 6613-10-13 | 6591-16-17 | 6824-7 | | | | |
| 6586-22 | -16 | 6601-29-31 | | | | | |
| 6598-4 | 6693-24 | 6602-13 | | | | | |
| 6601-31 | 6709-14 | 6613-10-13 | Mucking | Ventila-tion | Grizzlies | Insur-ance | Tons/ foot |
| 6613-10-13 | 6736-10 | -16 | | | | | |
| -16 | 6823-6 | 6674-8 | 6480-7 | 6107-32 | 6107-31 | 6239-11 | 6776-15 |
| 6681-11-12 | 6824-4-7 | 6681-10-12 | 6514-14-15 | 6167-27 | 6167-26-27 | 6290-18 | |
| 6693-15-16 | | 6693-10-11 | 6601-31 | 6290-18 | 6495-14 | | |
| -17-18 | | -12-13 | 6640-7 | 6480-7 | | | |
| -19-20 | | -14-15 | 6674-8 | 6640-7 | | | |
| -22 | | -19-20 | 6709-14 | 6674-8 | | | |
| 6693-23-24 | | -22-23 | 6736-11 | 6736-10 | | | |
| 6707-20 | | -24 | | | | | |
| 6709-14 | | 6707-17 | Hauling | Drills | Pumping | Sani-tation | |
| 6736-10 | | 6709-14 | | | | | |
| 6776-13-14 | | 6735-4 | 6167-27 | 6107-33 | 6640-7 | 6107-32 | |
| 6786-28 | | 6736-10 | 6480-7 | 6149-15 | 6674-8 | | |
| 6788-68 | | 6776-12-13 | 6601-31 | 6167-27 | 6681-10-11 | | |
| 6823-6 | | 6815-35-36 | 6709-14 | 6480-7 | | | |
| | | | 6736-11 | | | | |

| Shaft concrete | Hoisting | Compressed air | Hand tramming |
|---|---|---|---|
| 6588-12 | 6107-32 | 6149-15 | 6107-32 |
| 6602-13 | 6167-27 | 6181-21 | 6290-18 |
| 6640-7 | 6674-8 | 6514-14 | 6514-14-15 |
| 6674-8 | 6681-10-11 | 6543-12 | 6824-7 |
| | 6709-14 | 6601-31 | |
| | 6736-11 | 6681-10-11 | |
| | 6824-7 | 6736-10 | |



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METAL MINING - Continued

COSTS - DOLLARS - Continued

Mining

Surface

| Labor | Comp. air drills, steel | Explosives | Other supplies | Repairs | Power | Fuel | Supervision |
|---|---|---|---|---|---|---|---|
| 6234-22 | 6234-22 | 6234-22 | 6234-22 | 6234-22 | 6234-22 | 6234-22 | 6234-22 |
| 6248-30-31 | 6248-30 | 6248-30 | 6248-30-31 | 6248-30-31 | 6248-30 | 6412-27-28 | 6659-15 |
| 6412-27-28 | 6412-27-28 | 6412-27-28 | 6412-27-28 | 6412-27-28 | 6412-27-28 | 6666-16 | 6666-16 |
| 6462-12-14 | 6666-16 | 6462-12-14 | 6462-12-14 | | 6462-12-14 | 6788-11 | 6788-13 |
| 6503-32 | | 6666-16 | 6503-32 | | 6503-32 | | |
| 6659-15 | | | 6659-15 | | 6659-15 | | General |
| 6666-16 | | | 6666-16 | | 6666-16 | | 6232-22 |
| 6788-13 | | | 6788-13 | | | | 6248-30 |
| | | | | | Power lines | | 6462-12 |
| | | | | | 6234-22 | | 6659-15 |
| | | | | | | | 6666-16 |

| Breaking | | Loading | | | Hauling | | Miscellaneous |
|---|---|---|---|---|---|---|---|
| General | Drilling, churn | General | Shovels | Draglines | General | Track | |
| 6234-22 | 6234-22 | 6234-22 | 6412-27-28 | 6788-29 | 6234-22 | 6234-22 | 6234-22 |
| 6248-30-31 -32 | 6412-27-28 | 6248-30-31 -32 | 6666-16 | Dragline buckets | 6248-32 | 6412-27-28 | 6248-32 |
| 6412-27-28 | 6666-16 | 6412-27-28 | 6788-29 | 6788-21 | 6412-27-28 | Auto trucks | 6503-32 |
| 6503-32 | | 6503-32 | | | 6462-12-14 | 6248-30-31 | 6666-16 |
| 6666-16 | | 6666-16 | Dredges | | 6503-32 | 6489-7 | 6788-13 |
| Blasting | Piston | 6788-13 | 6357-7-8-10 | | 6666-16 | 6497-2 | Pumping |
| | | Scraper | 6659-15 | Wire rope | 6788-13 | 6532-11 | |
| 6412-27-28 | 6356-7 | | 6660-14 | 6788-21 | 6804-32 | 6735-2 | 6788-13 |
| 6666-16 | | 6788-19 | | | Aerial tram | 6788-4 | |
| | | | | | 6379-3 | 6799-8 | |
| | | | | | 6544-9 | 6800-30 | |
| | | | | | 6604-11 | 6824-6 | |



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## METAL MINING - Continued

### COSTS - DOLLARS - Continued

### Mining - Continued

#### Surface - Placer

| Hand | Hydraulic | Excavating | Pipe | Giants | Flumes | Scraper |
|---|---|---|---|---|---|---|
| 6786-56 | 6787-35-41 -42-43-44 -45-46-47 -48-49-50 -51-52-53 -54-55-56 -57-58-59 -60-61-62 -63-64-65 | 6788-13 | 6787-14-17 -18 | 6787-21 | 6787-12 | 6788-19 |
| **Ground sluicing** | | **Hauling** | **Pipelines** | **Pumping** | **Lumber** | |
| 6786-63-67 -68-69-70 -71-72-73 | | 6788-13 | 6787-19 | 6788-13 | 6787-67 | |

#### Surface - Dredging

| Labor | Super-vision | Power | Supplies | Miscel. | Ladder dredge | Pipe | Per cubic yard |
|---|---|---|---|---|---|---|---|
| 6659-15 6660-14 6787-35 6788-52 | 6659-15 6660-14 6787-35 6788-52 | 6659-15 6660-13-14 6788-52 | 6659-15 6660-14 6787-35 6788-52 | 6659-15 6660-14-15 6788-52 | 6788-61 **Pump** 6357-7-8 -10 | 6592-11 | 6659-15 6660-14 |



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METAL MINING - Continued

COSTS - DOLLARS - Continued

Mining - Continued

Underground

| Labor | Super-vision | Comp. air drills, steel | Power | Explo-sives | Timber | Other supplies |
|---|---|---|---|---|---|---|
| 6092-11 | 6092-11 | 6092-11 | 6092-11 | 6092-11 | 6138-12 | 6092-11 |
| 6113-11 | 6113-11 | 6113-11 | 6113-11 | 6113-11 | 6145-16 | 6113-11 |
| 6121-10 | 6121-10 | 6121-10 | 6121-10 | 6121-10 | 6167-25 | 6121-10 |
| 6138-12 | 6138-12 | 6138-12 | 6138-12 | 6138-12 | 6168-31 | 6138-12 |
| 6145-16 | 6145-16 | 6145-16 | 6145-16 | 6145-16 | 6169-23 | 6145-16 |
| 6149-15 | 6149-15 | 6149-15 | 6150-9 | 6149-15 | 6179-12-13 | 6149-15 |
| 6150-9 | 6150-9 | 6159-8 | 6159-8 | 6150-9 | 6180-9 | 6150-9 |
| 6159-8 | 6159-8 | 6168-31 | 6167-25 | 6159-8 | 6232-20 | 6159-8 |
| 6181-21 | 6181-21 | 6169-23 | 6168-31 | 6167-25 | 6238-11 | 6168-31 |
| 6167-25 | 6168-31 | 6174-9 | 6169-23 | 6168-31 | 6240-8 | 6169-23 |
| 6168-31 | 6169-23 | 6179-12-13 | 6174-9 | 6169-23 | 6247-40 | 6174-9 |
| 6169-23 | 6174-9 | 6180-9 | 6179-12-13 | 6174-9 | 6250-11 | 6179-12-13 |
| 6174-9 | 6179-12-13 | 6232-20 | 6180-9 | 6179-12-13 | 6260-20 | 6180-9 |
| 6179-12-13 | 6180-9 | 6238-11 | 6181-21 | 6180-9 | 6284-11 | 6181-21 |
| 6180-9 | 6232-20 | 6239-11 | 6186-17 | 6181-21-22 | 6289-16-18 | 6186-17 |
| 6181-21 | 6238-11 | 6240-8 | 6232-20 | 6186-17 | 6290-17 | 6232-20 |
| 6186-17 | 6239-11 | 6247-40 | 6238-11 | 6232-20 | 6307-34 | 6238-11 |
| 6232-20 | 6240-8 | 6250-11 | 6239-11 | 6238-11 | 6311-13 | 6239-11 |
| 6238-11 | 6247-40 | 6260-20 | 6240-8 | 6239-11 | 6322-9 | 6240-8 |
| 6239-11 | 6260-20 | 6284-11 | 6247-40 | 6240-8 | 6325-10 | 6247-40 |
| 6240-8 | 6276-7 | 6286-7 | 6260-20 | 6247-40 | 6327-12 | 6250-10 |
| 6247-40 | 6284-11 | 6289-16-18 | 6276-7 | 6260-20 | 6360-20 | 6260-20 |
| 6250-11 | 6290-17 | 6290-17 | 6284-11 | 6276-7 | 6368-17 | 6276-7 |
| 6260-20 | 6307-34 | 6307-34 | 6286-7 | 6284-11 | 6348-11 | 6284-11 |
| 6276-7 | 6311-13 | 6311-13 | 6290-17 | 6286-7 | 6369-24 | 6286-7 |
| 6284-11 | 6322-9 | 6322-9 | 6307-34 | 6289-16-18 | 6371-10 | 6290-17 |
| 6286-7 | 6325-10 | 6325-10 | 6311-13 | 6290-17 | 6372-6 | 6307-34 |
| 6289-16-18 | 6327-12 | 6327-12 | 6322-9 | 6307-34 | 6377-12 | 6311-13 |
| 6290-17 | 6348-11 | 6348-11 | 6325-10 | 6311-13 | 6380-8 | 6322-9 |
| 6307-34 | 6360-20 | 6360-20 | 6327-12 | 6322-9 | 6390-6 | 6325-10 |
| 6311-13 | 6368-17 | 6368-17 | 6360-20 | 6325-10 | 6402-9 | 6327-12 |
| 6322-9 | 6369-24 | 6369-24 | 6368-17 | 6327-12 | 6407-7 | 6348-11 |
| 6325-10 | 6371-10 | 6371-10 | 6371-10 | 6348-11 | 6410-41 | 6360-20 |
| 6327-12 | 6372-6 | 6372-6 | 6372-6 | 6360-20 | 6413-24-25 | 6368-17 |
| 6348-11 | 6377-12 | 6377-12 | 6377-12 | 6368-17 | 6462-14 | 6369-24 |
| 6360-20 | 6380-8 | 6380-8 | 6380-8 | 6369-24 | 6464-13 | 6371-10 |
| 6368-17 | 6390-6 | 6390-6 | 6402-9 | 6371-10 | 6470-5 | 6372-6 |
| 6369-24 | 6397-8 | 6397-8 | 6407-7 | 6372-6 | 6490-10 | 6377-12 |
| 6371-10 | 6402-9 | 6402-9 | 6410-41 | 6377-12 | 6515-14 | 6380-8 |



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METAL MINING - Continued

COSTS - DOLLARS - Continued

Mining - Continued

Underground - Continued

| Labor | Super-vision | Comp- air drills, steel | Power | Explo-sives | Timber | Other supplies |
|---|---|---|---|---|---|---|
| 6372-6 | 6407-7 | 6407-7 | 6413-25 | 6330-8 | 6525-10 | 6390-6 |
| 6377-12 | 6410-41 | 6410-41 | 6462-14 | 6390-6 | 6543-9 | 6402-9 |
| 6330-8 | 6464-13 | 6413-24 | 6464-13 | 6397-8 | 6565-12 | 6407-7-9 |
| 6390-6 | 6470-5 | 6464-13 | 6515-14 | 6402-9 | 6612-13 | 6410-41 |
| 6397-8 | 6490-10 | 6470-5 | 6525-10 | 6407-7-9 | 6661-29-30 | 6413-24 |
| 6402-9 | 6515-14 | 6490-10 | 6543-9-10 | 6410-41 | 6662-9 | 6462-14 |
| 6407-7-9 | 6525-10 | 6515-14 | 6601-27-28 | 6413-24-25 | 6666-16 | 6464-13 |
| 6410-41 | 6543-10 | 6525-10 | 6612-13 | 6462-14 | 6673-14 | 6490-10 |
| 6413-24-25 | 6612-13 | 6543-9 | 6656-15 | 6464-13 | 6688-57-58 | 6514-15 |
| 6462-14 | 6661-29-30 | 6565-12 | 6660-12 | 6470-5 | 6691-71 | 6515-14 |
| 6464-13 | 6662-9 | 6656-15 | 6661-29-30 | 6490-10 | 6709-12 | 6525-10 |
| 6470-5 | 6666-16 | 6662-9 | 6662-9 | 6515-14 | 6736-8-12 | 6543-9 |
| 6490-10 | 6673-14 | 6666-16 | 6666-16 | 6525-10 | 6741-17 | 6565-12 |
| 6514-15 | 6688-57-58 | 6673-14 | 6673-14 | 6543-9 | 6776-24-25 | 6612-13 |
| 6515-14 | 6709-12 | 6688-57-58 | 6688-57-58 | 6565-12 | 6799-8-9 | 6656-15 |
| 6525-10 | 6736-8-12 | 6691-71 | 6735-2 | 6612-13 | 6804-34 | 6661-29-30 |
| 6543-9 | 6741-17 | 6709-12 | 6736-8-12 | 6656-15 | 6806-13 | 6662-9 |
| 6565-12 | 6815-33-34 | 6736-8-12 | 6741-17 | 6661-29-30 | 6815-33-34 | 6666-16 |
| 6612-13 | 6823-7 | 6741-17 | 6776-24-25 | 6662-9 | 6824-6 | 6673-14 |
| 6656-15 | | 6776-24-25 | 6804-34 | 6666-16 | | 6688-57-58 |
| 6661-29-30 | | 6804-34 | 6815-33-34 | 6673-14 | | 6709-12 |
| 6662-9 | | 6806-14 | 6823-7 | 6688-57-58 | | 6736-8-12 |
| 6666-16 | | 6815-33-34 | 6824-5 | 6691-71 | | 6741-17 |
| 6673-14 | | 6824-8 | | 6709-12 | | 6776-24-25 |
| 6688-57-58 | | | | 6736-8-12 | | 6786-63 |
| 6691-71 | | | | 6741-17 | | 6799-9 |
| 6709-12 | | | | 6776-24-25 | | 6804-34 |
| 6736-8-12 | | | | 6799-8-9 | | 6815-33-34 -35 |
| 6741-17 | | | | 6804-34 | | 6823-7 |
| 6776-24-25 | | | | 6806-13 | | |
| 6786-63 | | | | 6815-33-34 | | |
| 6799-8-9 | | | | 6823-6-7 | | |
| 6804-34 | | | | 6824-5 | | |
| 6815-33-34 -35 | | | | | | |
| 6823-7 | | | | | | |



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METAL MINING - Continued

COSTS - DOLLARS - Continued

Mining - Continued

Underground - Continued

| Development | Mining | Transportation | General underground | General surface | Breaking | Timbering | Pumping |
|---|---|---|---|---|---|---|---|
| 6092-11 | 6092-11 | 6092-9-11 | 6138-12 | 6145-16 | 6181-21 | 6348-11 | 6092-11 |
| 6138-12 | 6138-12 | 6138-12 | 6145-16 | 6149-15 | 6407-8 | 6368-19 | 6150-9 |
| 6145-16 | 6145-16 | 6145-16 | 6149-15 | 6150-9 | 6543-10 | 6369-24 | 6181-21 |
| 6168-31 | 6159-8 | 6149-15 | 6150-9 | 6159-8 | 6661-29 | 6543-10 | 6250-11 |
| 6169-23 | 6167-25 | 6150-9 | 6159-8 | 6168-31 | 6666-16 | 6736-12 | 6284-11 |
| 6179-12-13 | 6168-31 | 6159-8 | 6167-25 | 6169-23 | 6736-12 | 6806-10 | 6368-17 |
| 6180-9 | 6169-23 | 6167-25 | 6168-31 | 6174-9 | 6799-8 | 6823-7 | 6369-24 |
| 6186-17 | 6179-12-13 | 6168-31 | 6169-23 | 6179-12-13 | 6804-37 | 6824-7 | 6371-10 |
| 6232-20 | 6180-9 | 6169-23 | 6174-9 | 6180-9 | 6806-10 | | 6413-25 |
| 6238-11 | 6181-21 | 6179-12-13 | 6179-12-13 | 6232-20 | 6823-7 | | 6515-14 |
| 6239-11 | 6186-17 | 6180-9 | 6180-9 | 6238-11 | 6824-7 | | 6688-57 |
| 6240-8 | 6232-20 | 6186-17 | 6232-20 | 6247-40 | | | 6736-12 |
| 6247-40 | 6238-11 | 6232-20 | 6238-11 | 6276-7 | Mucking | Hoisting | 6804-34-37 |
| 6250-11 | 6239-11 | 6238-11 | 6239-11 | 6286-7 | | | Loading |
| 6260-20 | 6240-8 | 6239-11 | 6240-8 | 6290-17 | 6368-19 | 6092-11 | |
| 6284-11 | 6247-40 | 6240-8 | 6247-40 | 6307-34 | 6397-8 | 6150-9 | |
| 6290-17 | 6250-11 | 6247-40 | 6250-11 | 6311-13 | 6799-8 | 6181-21 | 6167-25 |
| 6307-34 | 6260-20 | 6250-11 | 6286-7 | 6322-9 | 6823-7 | 6167-25 | 6181-21 |
| 6311-13 | 6276-7 | 6260-20 | 6290-17 | 6325-10 | | 6250-11 | 6368-19 |
| 6322-9 | 6284-11 | 6284-11 | 6307-34 | 6360-20 | | 6311-13 | 6413-25 |
| 6327-12 | 6286-7 | 6286-7 | 6311-13 | 6368-17 | Filling | 6369-24 | 6586-22 |
| 6348-11 | 6289-14-15 | 6290-17 | 6322-9 | 6369-24 | | 6413-25 | 6656-16 |
| 6360-20 | -16-17-18 | 6307-34 | 6325-10 | 6371-10 | 6145-16 | 6470-5 | 6823-7 |
| 6368-17 | 6290-17 | 6322-9 | 6348-11 | 6372-6 | 6368-19 | 6503-11 | |
| 6369-24 | 6303-29 | 6325-10 | 6360-20 | 6377-12 | 6815-34 | 6543-9-10 | Block-holing |
| 6371-10 | 6307-34 | 6327-12 | 6368-17 | 6380-8 | 6816-23-24 | 6673-14 | |
| 6372-6 | 6311-13 | 6348-11 | 6371-10 | 6390-6 | Tramming | 6688-57 | 6149-15 |
| 6377-12 | 6322-9 | 6360-20 | 6372-6 | 6397-8 | | 6736-12 | 6186-17 |
| 6380-8 | 6325-10 | 6368-17 | 6377-12 | 6402-9 | 6092-11 | 6799-8 | 6402-9 |
| 6390-6 | 6327-12 | 6369-24 | 6380-8 | 6407-7 | 6181-21 | 6804-34-37 | 6601-29 |
| 6397-8 | 6348-11 | 6371-10 | 6390-6 | 6410-41 | 6397-8 | 6806-10 | 6661-29 |
| 6402-9 | 6360-20 | 6372-6 | 6397-8 | 6413-25 | 6413-25 | | |
| 6410-41 | 6368-17-18 | 6377-12 | 6402-9 | 6464-13 | 6470-5 | Ventilation | Power |
| 6462-14 | -19 | 6380-8 | 6407-7 | 6470-5 | 6543-10 | | |
| 6470-5 | 6369-24 | 6390-6 | 6410-41 | 6490-10 | 6565-12 | 6250-11 | 6413-26 |
| 6490-10 | 6371-10 | 6397-8 | 6413-25 | 6503-11-15 | 6586-22 | 6369-24 | 6806-14 |



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METAL MINING - Continued

COSTS - DOLLARS - Continued

Mining - Continued

Underground - Continued

| Development | Mining | Transportation | General underground | General surface | Breaking | Ventilation | Power |
|---|---|---|---|---|---|---|---|
| 6503-11-15 | 6372-6 | 6402-9 | 6464-13 | -18-21-24 | 6673-14 | 6407-9 | 6824-1 |
| -18-21-24 | 6377-12 | 6407-7 | 6470-5 | -27-29 | 6736-12 | 6413-25 | |
| -27-29 | 6380-8 | 6410-41 | 6490-10 | 6515-14 | 6799-8 | Shops | Fuel oil |
| 6514-15 | 6390-6 | 6464-13 | 6503-11-15 | 6525-10 | 6804-37 | | |
| 6515-14 | 6397-8 | 6490-10 | -18-21-24 | 6543-9 | 6806-10 | 6167-25 | 6276-7 |
| 6525-10 | 6402-9 | 6503-11-15 | -27-29 | 6601-29 | 6815-33-34 | 6407-9 | 6413-26 |
| 6565-12 | 6407-7 | -18-21-24 | 6515-14 | 6656-15 | -35 | 6681-7 | 6824-5 |
| 6601-29 | 6410-41 | -27-29 | 6525-10 | 6661-29-30 | 6824-7 | | |
| 6656-15 | 6413-24-25 | 6515-14 | 6543-9-10 | 6662-9 | | | |
| 6661-29-30 | 6462-14 | 6525-10 | 6565-12 | 6688-57 | Miscel. | Plant | Housing |
| 6662-9 | 6464-13 | 6543-9 | 6601-29 | 6736-8 | | | |
| 6673-14 | 6470-5 | 6565-12 | 6656-15 | 6741-17 | 6167-25 | 6681-8-9 | 6543-10 |
| 6688-57 | 6479-8 | 6601-29 | 6661-29-30 | 6776-22-23 | 6250-11 | 6799-5-6 | 6681-7 |
| 6709-12 | 6490-10 | 6656-15 | 6662-9 | 6804-34 | 6543-10 | 6800-15-18 | 6736-12 |
| 6735-9 | 6503-8-15 | 6661-29-30 | 6666-16 | 6806-10 | 6693-20 | | |
| 6736-8 | -18-21-24 | 6662-9 | 6673-14 | 6815-33-34 | 6736-12 | Sampling | Hospital |
| 6741-17 | -27-29 | 6666-16 | 6688-57 | | 6823-7 | | |
| 6776-22-23 | 6514-15 | 6688-57 | 6709-12 | | | 6543-10 | 6543-10 |
| 6800-29 | 6515-14 | 6709-12 | 6735-9 | | | 6693-20 | 6736-12 |
| 6804-34-37 | 6525-10 | 6735-9 | 6736-8 | | Sorting | 6736-12 | |
| 6815-33-34 | 6532-11 | 6736-8 | 6741-17 | | | | |
| 6823-7 | 6543-9 | 6741-17 | 6776-22-23 | | 6543-10 | | |
| 6824-7 | 6565-12 | 6776-22-23 | 6804-34-37 | | | | |
| | 6586-22 | 6804-34 | 6815-33-34 | | Royalty | | |
| | 6601-29 | 6815-34 | 6824-7 | | | | |
| | 6656-15 | 6823-7 | | | 6774-6-8 | | |
| | 6661-29-30 | 6824-7 | | | | | |
| | 6662-9 | | | | Drift mining | | |
| | 6673-14 | | | | | | |
| | 6688-57 | | | | 6788-68-71 | | |
| | 6691-73 | | | | -73 | | |
| | 6709-12 | | | | | | |
| | 6736-8-12 | | | | | | |
| | 6741-17 | | | | | | |
| | 6776-22-23 | | | | | | |
| | 6785-1 | | | | | | |
| | 6799-9 | | | | | | |
| | 6800-29 | | | | | | |
| | 6804-34-37 | | | | | | |
| | 6806-10 | | | | | | |
| | 6815-33-34 | | | | | | |
| | 6823-7 | | | | | | |
| | 6824-7 | | | | | | |



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METAL MINING - Continued

COSTS - DOLLARS - Continued

Mining - Continued

Underground - Continued

| System | Development | Stoping | Transportation | General underground | General surface | Total |
|---|---|---|---|---|---|---|
| Open stope..... | 6785-6-7 | 6785-6-7 | 6785-6-7 | 6785-6-7 | 6785-6-7 | 6785-6-7 |
| Shrinkage..... | -10 | -10 | -10 | -10 | -10 | -10 |
| Cut-and-fill.... | -13 | -13 | -13 | -13 | -13 | -13 |
| Square set..... | -17 | -17 | -17 | -17 | -17 | -17 |
| Undercut block caving..... | -19 | -19 | -19 | -19 | -19 | -19 |
| Sublevel caving. | -20 | -20 | -20 | -20 | -20 | -20 |
| Top slicing..... | -22 | -22 | -22 | -22 | -22 | -22 |
| Combinations.... | -23 | -23 | -23 | -23 | -23 | -23 |
| Flat beds..... | -24 | -24 | -24 | -24 | -24 | -24 |
| Tabular below 45° dip..... | -26 | -26 | -26 | -26 | -26 | -26 |
| Tabular above 45° dip..... | -28-29-30 | -28-29-30 | -28-29-30 | -28-29-30 | -28-29-30 | -28-29-30 |
| Irregular masses | -32-33 | -32-33 | -32-33 | -32-33 | -32-33 | -32-33 |

| System | Labor | Comp. air drills, steel | Power | Explosives | Supplies | Total |
|---|---|---|---|---|---|---|
| Open stope..... | 6785-8 | 6785-8 | 6785-8 | 6785-8 | 6785-8 | 6785-8 |
| Shrinkage..... | -11 | -11 | -11 | -11 | -11 | -11 |
| Cut-and-fill.... | -15 | -15 | -15 | -15 | -15 | -15 |
| Square set..... | -18 | -18 | -18 | -18 | -18 | -18 |
| Undercut block caving..... | -19 | -19 | -19 | -19 | -19 | -19 |
| Sublevel caving. | -21 | -21 | -21 | -21 | -21 | -21 |
| Top slicing..... | -22 | -22 | -22 | -22 | -22 | -22 |
| Combinations.... | -23 | -23 | -23 | -23 | -23 | -23 |
| Flat beds..... | -25 | -25 | -25 | -25 | -25 | -25 |
| Tabular below 45° dip..... | -27 | -27 | -27 | -27 | -27 | -27 |
| Tabular above 45° dip..... | -31-32 | -31-32 | -31-32 | -31-32 | -31-32 | -31-32 |
| Irregular masses | -34 | -34 | -34 | -34 | -34 | -34 |



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## METAL MINING - Continued

### COSTS - MATERIAL UNITS

### Mining

#### Surface

| Stripping | | Mining | |
|---|---|---|---|
| Explosives | Fuel | Explosives | Fuel |
| 6234-23 | 6234-23 | 6234-23<br>6462-13<br>6666-17 | 6234-23<br>6666-17 |

#### Underground

| Explosives | | | | Timber | | Other supplies | Fuel |
|---|---|---|---|---|---|---|---|
| 6092-12 | 6276-8 | 6470-6 | 6815-35 | 6107-29 | 6380-9 | 6092-12 | 6397-9 |
| 6107-29 | 6284-12 | 6490-11 | 6823-7 | 6145-17 | 6402-10 | 6113-11 | 6666-17 |
| 6113-11 | 6286-8 | 6503-8-11 | | 6149-16 | 6410-48 | 6121-11 | 6738-11 |
| 6121-11 | 6290-18 | -15-18-21 | Stoping | 6167-25 | 6416-14 | 6145-17 | 6806-14 |
| 6145-17 | 6311-14 | -24-27-29 | | 6168-32 | 6440-31 | 6250-11 | |
| 6149-16 | 6322-10 | 6512-12 | 6186-18 | 6179-14 | 6462-13 | 6368-19 | |
| 6150-10 | 6325-11 | 6514-15 | 6232-21 | 6180-10 | 6464-13 | 6369-25 | |
| 6151-14 | 6327-13 | 6515-15 | 6238-12 | 6232-21 | 6470-6 | 6804-38 | |
| 6152-15 | 6348-12 | 6525-11 | 6360-20 | 6237-20-21 | 6490-11 | | |
| 6159-9 | 6360-21 | 6526-20 | 6368-19 | 6238-12 | 6503-18-21 | | |
| 6167-25 | 6361-20 | 6543-11 | 6565-13 | 6247-41 | -24-27-29 | | |
| 6168-32 | 6368-20 | 6565-13 | 6601-30 | 6250-11 | 6512-12 | | |
| 6170-21 | 6369-25-26 | 6601-30 | | 6260-21 | 6514-15 | | |
| 6174-10 | 6370-15 | 6656-16 | | 6284-12 | 6515-15 | | |
| 6179-14 | 6371-11 | 6661-29-31 | Bull-dozing | 6311-14 | 6526-20 | | |
| 6180-10 | 6372-7 | 6662-9 | 6186-18 | 6322-10 | 6543-11 | | |
| 6181-22 | 6377-13 | 6666-17 | 6360-20 | 6325-11 | 6565-13 | | |
| 6186-18 | 6380-9 | 6673-15 | 6402-10 | 6327-13 | 6661-29-31 | | |
| 6237-20-21 | 6390-7 | 6688-56 | 6565-13 | 6348-12 | 6673-15 | | |
| 6238-12 | 6397-9 | 6691-72-73 | 6601-30 | 6360-21 | 6688-56 | | |
| 6239-11 | 6402-10 | 6709-13 | | 6368-19-20 | 6691-72-73 | | |
| 6240-8 | 6410-47 | 6736-9 | | 6369-25-26 | 6709-13 | | |
| 6247-41 | 6416-14 | 6741-18 | | 6370-15 | 6736-9 | | |
| 6248-31 | 6440-31 | 6776-19-20 | | 6371-11 | 6776-19-20 | | |
| 6250-11 | 6462-13 | -21-27 | | 6372-7 | -21-27 | | |
| 6260-21 | 6464-13 | 6804-35 | | 6377-13 | 6815-35 | | |

| | Open stope | Shrinkage | Cut-and-fill | Square set | Undercut block caving | Sublevel caving | Top slicing |
|---|---|---|---|---|---|---|---|
| Explosives | 6785-42-43 | 6785-44 | 6785-45 | 6785-46 | 6785-46 | 6785-47 | 6785-47 |
| Timber.... | -42-43 | -44 | -45 | -46 | -46 | -47 | -47 |



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METAL MINING - Continued

COSTS - MATERIAL UNITS - Continued

Development

| Explosives, pounds per ton or foot | | | | Timber, bd.-ft. per ton | | | Miscel. |
|---|---|---|---|---|---|---|---|
| 6107-30 | 6284-12-13 | 6390-7-8 | 6640-5 | 6107-30 | 6369-29 | 6661-29 | Concrete |
| 6138-13-14 | 6322-10 | 6397-9 | 6661-29 | 6138-13-14 | 6370-16 | 6674-10 | 6602 |
| 6145-17-18 | 6327-13-14 | 6402-10-11 | 6662-9 | 6145-17-18 | 6371-11-12 | 6709-13-14 | -14 |
| 6149-17 | 6348-12-13 | 6410-47 | 6674-10 | 6167-25 | 6372-8 | 6736-9-10 | Plant |
| 6181-22 | 6360-21 | 6416-14 | 6709-13-14 | 6168-32 | 6377-13 | 6815-35 | |
| 6167-25 | 6368-21 | 6440-31 | 6736-9-10 | 6237-20-21 | 6390-7 | | |
| 6168-32 | 6369-25-26 | 6480-8 | 6741-18 | 6238-13 | 6402-11 | | 6799 |
| 6179-15 | -27-28 | 6490-11-12 | 6804-35-36 | 6284-12-13 | 6440-31 | | -5 |
| 6186-18 | -29 | 6515-15-16 | 6815-35 | 6322-10 | 6490-11-12 | | |
| 6232-21 | 6370-16 | 6525-11 | 6824-4 | 6327-13-14 | 6515-15-16 | | |
| 6237-20-21 | 6371-12 | 6543-12 | | 6348-13 | 6525-11 | | |
| 6238-12-13 | 6372-8 | 6565-13 | | 6360-21 | 6543-12 | | |
| 6250-11 | 6377-13 | 6601-30 | | 6368-21 | 6565-13 | | |
| 6260-21 | 6380-9-10 | 6602-14 | | 6369-27-28 | 6602-14 | | |



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## METAL MINING - Continued

### COSTS - LABOR UNITS

### Development

### Stripping

| Breaking | Loading | Hauling | Track | Repairs | Supervision |
|---|---|---|---|---|---|
| 6234-23 | 6234-23 | 6234-23 | 6234-23 | 6234-23 | 6234-23 |

### Underground

| Drilling and blasting | | Mucking | | Hauling | Hoisting | Timbering | Filling |
|---|---|---|---|---|---|---|---|
| 6138-13-14 | 6525-11 | 6138-13-14 | 6543-12 | 6138-13-14 | 6138-13-14 | 6138-13-14 | 6138-13 |
| 6145-17-18 | 6526-20 | 6145-17-18 | 6565-13 | 6179-15 | 6179-15 | 6145-17-18 | 6145-17 |
| 6149-16-17 | 6543-12 | 6149-16-17 | 6586-23-24 | 6180-10 | 6180-10 | 6179-15 | 6290-18 |
| 6168-32 | 6565-13 | 6170-21 | 6588-9-10 | 6322-10 | 6234-12 | 6180-10 | 6360-21 |
| 6170-21 | 6586-23-24 | 6179-15 | 6601-30 | 6327-13 | 6322-10 | 6284-12-13 | 6440-31 |
| 6179-15 | 6588-9-10 | 6180-10 | 6602-14 | 6348-12-13 | 6327-13 | 6290-18 | 6515-15 |
| 6180-10 | 6601-30 | 6284-12-13 | 6640-5-8 | 6368-21 | 6348-12-13 | 6327-13-14 | 6736-9 |
| 6284-12-13 | 6602-14 | 6290-18 | 6662-9 | 6369-25-26 | 6368-21 | 6348-12-13 | |
| 6290-18 | 6640-8 | 6322-10 | 6673-15 | -27-28 | 6369-25-26 | 6360-21 | Hand tramming |
| 6322-10 | 6662-9 | 6327-13-14 | 6674-9 | -29 | -27-28 | 6369-25-26 | 6149-17 |
| 6327-13-14 | 6673-15 | 6348-12-13 | 6709-13 | 6371-11-12 | -29 | -27-28 | 6284-12-13 |
| 6348-12-13 | 6674-9 | 6360-21 | 6736-9-10 | 6380-9-10 | 6371-11-12 | -29 | 6327-14 |
| 6360-21 | 6709-13 | 6369-25-26 | 6815-35 | 6390-7-8 | 6380-9-10 | 6371-11-12 | 6360-21 |
| 6369-25-26 | 6736-9-10 | -27-28 | | 6416-14 | 6390-7-8 | 6380-9-10 | 6397-9 |
| -27-28 | 6741-18 | -29 | | 6440-31 | 6397-9 | 6390-7-8 | 6402-11 |
| -29 | 6815-35 | 6371-11-12 | | 6470-6 | 6440-31 | 6402-11 | |
| 6371-11-12 | | 6380-10 | | 6480-8 | 6470-6 | 6416-14 | |
| 6377-13 | | 6390-8 | | 6490-11 | 6490-12 | 6440-31 | |
| 6380-9-10 | | 6397-9 | Scraping | 6515-15-16 | 6515-15-16 | 6470-6 | Pumping |
| 6390-7-8 | | 6402-10-11 | | 6543-12 | 6543-12 | 6490-11-12 | |
| 6397-9 | | 6416-14 | 6380-9 | 6586-23-24 | 6586-23-24 | 6515-15-16 | 6368-21 |
| 6402-10-11 | | 6440-31 | 6390-7 | 6601-30 | 6601-30 | 6526-20 | 6369-25-26 |
| 6416-14 | | 6470-6 | 6586-23 | 6662-9 | 6602-14 | 6543-12 | 6602-14 |
| 6440-31 | | 6480-8 | | 6709-13 | 6640-8 | 6565-13 | 6674-9 |
| 6470-6 | | 6490-11-12 | | 6736-9-10 | 6662-9 | 6586-23-24 | |
| 6480-8 | | 6515-15-16 | | 6741-18 | 6709-13 | 6588-9-10 | |
| 6490-11-12 | | 6525-11 | | | 6736-9-10 | 6601-30 | |
| 6515-15-16 | | 6526-20 | | | 6741-18 | 6602-14 | |
| | | | | | | 6640-6 | |
| | | | | | | 6674-9 | |
| | | | | | | 6709-13 | |
| | | | | | | 6736-9-10 | |



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METAL MINING - Continued

COSTS - LABOR UNITS - Continued

Development - Continued

Underground - Continued

| Supervision | Miscel. under-ground | Total under-ground | Feet per shift | Tons per shift | Drifts, cross-cuts | Raises | Shafts, winzes |
|---|---|---|---|---|---|---|---|
| 6138-13-14 | 6138-13 | 6149-16 | 6145-18 | 6145-17 | 6107-30 | 6107-30 | 6107-30 |
| 6179-15 | 6145-18 | 6186-18 | 6149-17 | 6322-10 | 6149-17 | 6149-17 | 6237-21 |
| 6180-10 | 6180-10 | 6232-21 | 6167-25 | 6368-20 | 6167-25 | 6167-25 | 6238-13 |
| 6284-12-13 | 6322-10 | 6257-20 | 6179-15 | 6371-11 | 6237-21 | 6237-21 | 6284-12-13 |
| 6322-10 | 6348-12 | 6238-13 | 6237-21 | 6397-9 | 6238-13 | 6238-13 | 6368-21 |
| 6327-13 | 6360-21 | 6311-14 | 6238-13 | 6490-11 | 6368-21 | 6368-21 | 6490-12 |
| 6348-12-13 | 6371-11 | 6397-9 | 6250-11 | 6514-15 | 6369-27 | 6369-27 | 6515-16 |
| 6360-21 | 6380-9 | 6402-10 | 6284-13 | 6815-35 | 6440-31 | 6440-31 | 6588-9 |
| 6369-25-26 -27 | 6390-7 | 6526-20 | 6348-13 | Man-hr. per foot | 6480-8 | 6490-12 | 6602-14 |
| | 6410-44 | 6565-13 | 6369-27-28 -29 | | 6490-12 | 6515-16 | 6674-9 |
| 6371-11-12 | 6440-31 | 6586-23 | | 6149-17 | 6515-16 | 6565-13 | |
| 6380-9-10 | 6480-8 | 6662-9 | 6370-16 | 6369-27-28 -29 | 6565-13 | 6824-4 | |
| 6390-7-8 | 6490-11-12 | 6673-15 | 6371-12 | | | | |
| 6410-44 | 6515-15 | 6709-13 | 6372-8 | 6370-16 | | | |
| 6440-31 | 6586-23 | 6776-27 | 6380-10 | 6372-8 | | | |
| 6490-11-12 | 6673-15 | | 6390-8 | 6402-11 | | | |
| 6515-15-16 | 6709-13 | Ventila-tion | 6490-12 | 6480-8 | | | |
| 6543-12 | 6736-9 | | 6515-16 | 6490-12 | | | |
| 6586-23-24 | 6741-18 | 6480-8 | 6543-12 | 6515-16 | | | |
| 6602-14 | 6815-35 | | 6565-13 | 6543-12 | | | |
| 6673-15 | | Concret-ing | 6586-24 | 6586-24 | | | |
| 6709-13 | | | 6598-4 | 6598-4 | | | |
| 6736-9-10 | | 6602-14 | 6602-14 | 6602-14 | | | |
| 6741-18 | | 6640-5-8 | 6674-9 | 6661-29 | | | |
| 6815-35 | | | 6736-10 | 6674-9 | | | |
| | | | 6804-36 | 6736-10 | | | |
| | | | | 6804-36 | | | |



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## METAL MINING - Continued

### COSTS - LABOR UNITS - Continued

#### Mining

Surface

| Breaking | Loading | Hauling | Track | Repairs | Supervision | Trucking | Total mining |
|---|---|---|---|---|---|---|---|
| 6234-23<br>6462-13 | 6234-23<br>6462-13 | 6234-23<br>6462-13 | 6234-23 | 6234-23 | 6234-23 | 6462-13 | 6503-31<br>6666-17 |

| Placer mining | Dredging | | | | | |
|---|---|---|---|---|---|---|
| | Operation | Repairs | Water supply | Stream pollution | Miscel. | Per cubic yard |
| 6786-56-73<br>6787-35 | 6659-16 | 6659-16 | 6659-16 | 6659-16 | 6659-16 | 6659-16 |



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METAL MINING - Continued

COSTS - LABOR UNITS - Continued

Mining - Continued

Underground

| Breaking | Mucking | Tramming | Hauling | Hoisting | Supervision | General underground | Total underground |
|---|---|---|---|---|---|---|---|
| 6092-12 | 6092-12 | 6113-9 | 6092-12 | 6113-11 | 6138-13 | 6092-12 | 6107-29 |
| 6113-11 | 6113-9-11 | 6121-9 | 6113-11 | 6121-11 | 6149-16 | 6113-9-11 | 6113-9 |
| 6121-11 | 6121-9-11 | 6131-22 | 6121-11 | 6138-13 | 6150-10 | 6121-9-11 | 6121-9 |
| 6138-13 | 6138-13 | 6186-18 | 6138-13 | 6145-17 | 6159-9 | 6138-13 | 6232-21 |
| 6145-17 | 6145-17 | 6232-21 | 6145-17 | 6150-10 | 6168-32 | 6149-16 | 6239-11 |
| 6149-16 | 6149-16 | 6276-8 | 6149-16 | 6159-9 | 6170-21 | 6159-9 | 6247-41 |
| 6150-10 | 6150-10 | 6284-12 | 6150-10 | 6170-20 | 6174-10 | 6168-32 | 6286-8 |
| 6159-9 | 6159-9 | 6311-14 | 6159-9 | 6174-10 | 6180-10 | 6170-21 | 6290-18 |
| 6168-32 | 6170-21 | 6327-13 | 6168-32 | 6179-14 | 6181-22 | 6179-14 | 6322-10 |
| 6170-21 | 6174-10 | 6360-21 | 6170-21 | 6180-10 | 6232-21 | 6180-10 | 6325-11 |
| 6174-10 | 6179-14 | 6397-9 | 6174-10 | 6181-22 | 6237-20 | 6232-21 | 6348-12 |
| 6179-14 | 6180-10 | 6410-44 | 6179-14 | 6237-20 | 6238-12 | 6237-20 | 6360-21 |
| 6180-10 | 6181-22 | 6512-12 | 6180-10 | 6238-12 | 6239-11 | 6239-11 | 6369-25 |
| 6181-22 | 6232-21 | 6673-15 | 6181-22 | 6247-41 | 6240-8 | 6240-8 | 6370-15 |
| 6232-21 | 6238-12 | 6815-35 | 6237-20 | 6260-21 | 6247-41 | 6247-41 | 6371-11 |
| 6238-12 | 6239-11 | | 6238-12 | 6284-12 | 6260-21 | 6260-21 | 6372-7 |
| 6239-11 | 6240-8 | Timbering | 6240-8 | 6286-8 | 6284-12 | 6286-8 | 6380-9 |
| 6240-9 | 6247-41 | | 6247-41 | 6290-18 | 6286-8 | 6290-18 | 6390-7 |
| 6247-41 | 6260-21 | 6092-12 | 6260-21 | 6322-10 | 6290-18 | 6322-10 | 6410-44-46 |
| 6260-21 | 6276-8 | 6138-13 | 6286-8 | 6325-11 | 6311-14 | 6325-11 | 6416-14 |
| 6276-8 | 6284-12 | 6145-17 | 6290-18 | 6327-13 | 6322-10 | 6348-12 | 6464-13 |
| 6284-12 | 6286-8 | 6179-14 | 6322-10 | 6348-12 | 6327-13 | 6360-21 | 6470-6 |
| 6286-8 | 6290-18 | 6180-10 | 6325-11 | 6368-20 | 6348-12 | 6368-20 | 6490-11 |
| 6290-18 | 6311-14 | 6238-12 | 6327-13 | 6369-25-26 | 6360-21 | 6370-15 | 6503-6-7 |
| 6311-14 | 6322-10 | 6239-11 | 6348-12 | 6370-15 | 6368-20 | 6371-11 | -8-11-14 |
| 6322-10 | 6325-11 | 6247-41 | 6368-20 | 6371-11 | 6369-25 | 6377-13 | -15-17-18 |
| 6325-11 | 6327-13 | 6260-21 | 6369-25-26 | 6372-7 | 6370-15 | 6380-9 | -20-21-23 |
| 6327-13 | 6348-12 | 6276-8 | 6370-15 | 6377-13 | 6371-11 | 6390-7 | -24-27-29 |
| 6348-12 | 6360-21 | 6284-12 | 6371-11 | 6380-9 | 6372-7 | 6397-9 | 6515-15 |
| 6360-21 | 6368-20 | 6290-18 | 6372-7 | 6390-7 | 6377-13 | 6402-10 | 6525-11 |
| 6368-20 | 6369-25-26 | 6311-14 | 6377-13 | 6397-9 | 6380-9 | 6416-14 | 6565-12 |
| 6369-25-26 | 6370-15 | 6322-10 | 6380-9 | 6410-44 | 6390-7 | 6440-31 | 6586-23 |
| 6370-15 | 6371-11 | 6325-11 | 6390-7 | 6416-14 | 6397-9 | 6464-13 | 6601-30 |
| 6371-11 | 6372-7 | 6327-13 | 6402-10 | 6440-31 | 6402-10 | 6470-6 | 6656-16 |
| 6372-7 | 6397-9 | 6348-12 | 6410-44 | 6462-13 | 6416-14 | 6490-11 | 6661-29 |
| 6377-13 | 6402-10 | 6360-21 | 6416-14 | 6464-13 | 6440-31 | 6515-15 | 6662-9 |
| 6380-9 | 6416-14 | 6368-20 | 6440-31 | 6470-6 | 6462-13 | 6525-11 | 6673-15 |



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## METAL MINING - Continued

### COSTS - LABOR UNITS - Continued

#### Mining - Continued

##### Underground - Continued

| Breaking | Mucking | Timbering | Hauling | Hoisting | Supervision | General underground | Total underground |
|---|---|---|---|---|---|---|---|
| 6390-7 | 6440-31 | 6369-25-26 | 6462-13 | 6512-12 | 6464-13 | 6526-20 | 6688-55 |
| 6397-9 | 6470-6 | 6370-15 | 6464-13 | 6515-15 | 6470-6 | 6586-23 | 6709-13 |
| 6402-10 | 6490-11 | 6371-11 | 6470-6 | 6525-11 | 6490-11 | 6601-30 | 6736-9 |
| 6416-14 | 6515-15 | 6372-7 | 6490-11 | 6526-20 | 6515-15 | 6656-16 | 6776-19-20 |
| 6440-31 | 6525-11 | 6380-9 | 6512-12 | 6543-11 | 6525-11 | 6661-29-31 | -21-27 |
| 6462-13 | 6526-20 | 6440-31 | 6515-15 | 6586-23 | 6526-20 | 6662-9 | 6804-35 |
| 6464-13 | 6586-23 | 6462-13 | 6525-11 | 6601-30 | 6543-11 | 6673-15 | 6815-35 |
| 6470-6 | 6601-30 | 6464-13 | 6526-20 | 6656-16 | 6586-23 | 6688-55 | 6823-7 |
| 6490-11 | 6656-16 | 6470-6 | 6543-11 | 6662-9 | 6601-30 | 6709-13 | 6824-5 |
| 6512-12 | 6662-9 | 6490-11 | 6586-23 | 6673-15 | 6656-16 | 6736-9 | |
| 6515-15 | 6673-15 | 6512-12 | 6601-30 | 6688-55 | 6662-9 | 6741-18 | 3266-1 |
| 6525-11 | 6688-55 | 6515-15 | 6656-16 | 6709-13 | 6673-15 | 6815-35 | |
| 6526-20 | 6709-13 | 6526-20 | 6661-29-31 | 6736-9 | 6688-55 | 6823-7 | |
| 6543-11 | 6736-9 | 6543-11 | 6662-9 | 6741-18 | 6709-13 | | |
| 6586-23 | 6815-35 | 6586-23 | 6688-55 | 6804-35 | 6736-9 | | |
| 6601-30 | 6823-7 | 6601-30 | 6709-13 | 6815-35 | 6741-18 | | |
| 6656-16 | | 6662-9 | 6736-9 | | 6804-35 | | |
| 6661-29-31 | | 6688-55 | 6741-18 | | 6815-35 | | |
| 6662-9 | | 6709-13 | 6804-35 | | | | |
| 6673-15 | | 6736-9 | | | | | |
| 6688-55 | | 6741-18 | | | | | |
| 6709-13 | | 6804-35 | | | | | |
| 6736-9 | | 6815-35 | | | | | |
| 6741-18 | | | | | | | |
| 6804-35 | | | | | | | |
| 6815-35 | | | | | | | |
| 6823-7 | | | | | | | |



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METAL MINING - Continued

COSTS - LABOR UNITS - Continued

Mining - Continued

Underground - Continued

| Stoping | Hand mucking | Pumping | Surface | Tons produced per man-shift | | | |
|---|---|---|---|---|---|---|---|
| 6107-29 | 6159-9 | 6092-12 | 6149-16 | 6145-17 | 6248-31 | 6397-9 | 6662-9 |
| 6167-25 | 6170-21 | 6150-10 | 6174-10 | 6149-16 | 6250-11 | 6402-10 | 6666-17 |
| 6186-18 | 6586-23 | 6181-22 | 6237-20 | 6150-10 | 6260-21 | 6410-44-45 | 6673-15 |
| 6250-11 | 6656-16 | 6284-12 | 6276-8 | 6151-14 | 6276-8 | 6416-14 | 6688-55 |
| 6776-27 | | 6311-14 | 6325-10 | 6152-15 | 6284-12 | 6440-31 | 6691-70-71 |
| | | 6369-25-26 | 6369-25-26 | 6159-9 | 6286-8 | 6462-13 | -72-73 |
| Filling | Mechanical mucking | Bulldozing | 6402-10 | 6167-25 | 6290-18 | 6464-13 | 6709-13 |
| | | | 6416-14 | 6168-32 | 6311-14 | 6470-6 | 6736-9 |
| 6138-13 | 6159-9 | 6149-6 | 6462-13 | 6170-21 | 6322-10 | 6490-11 | 6741-18 |
| 6179-14 | 6170-21 | 6186-18 | 6512-12 | 6174-10 | 6325-11 | 6503-8 | 6776-26 |
| 6290-18 | 6380-9 | 6397-9 | 6661-29-30 | 6179-14 | 6327-13 | 6512-12 | 6786-63 |
| 6311-14 | 6390-7 | 6402-10 | 6736-9 | 6180-10 | 6348-12 | 6514-15 | 6800-14 |
| 6368-20 | 6586-23 | 6661-29 | 6741-18 | 6181-22 | 6360-21 | 6515-15 | 6804-35 |
| 6440-31 | 6656-16 | 6815-35 | 6776-26 | 6186-18 | 6361-20 | 6525-11 | 6815-35 |
| 6515-15 | | Mine | 6804-35 | 6232-21 | 6368-20 | 6526-20 | |
| 6662-9 | Sorting | Maintenance | | 6237-21 | 6369-25-26 | 6543-11 | |
| 6736-9 | 6543-11 | 6311-14 | | 6238-12 | 6372-7 | 6586-23 | Tons per man hour |
| 6741-18 | 6673-15 | 6372-7 | | 6239-11 | 6377-13 | 6601-30 | 6145-17 |
| 6816-24 | | | | 6240-8 | 6380-9 | 6656-16 | 6151-14 |
| | | | | 6247-41 | 6390-7 | 6661-29 | |

| System | Breaking | Timbering | Shoveling | Hauling, hoisting | General underground | Surface | Total |
|---|---|---|---|---|---|---|---|
| Open-stope | 6785-35-36 | 6785-35-36 | 6785-35-36 | 6785-35-36 | 6785-35-36 | 6785-35-36 | 6785-35-36 |
| Shrinkage | -36-37 | -36-37 | -36-37 | -36-37 | -36-37 | -36-37 | -36-37 |
| Cut-and-fill | -38 | -38 | -38 | -38 | -38 | -38 | -38 |
| Square set | -39 | -39 | -39 | -39 | -39 | -39 | -39 |
| Undercut block caving | -39 | -39 | -39 | -39 | -39 | -39 | -39 |
| Sublevel caving | -40 | -40 | -40 | -40 | -40 | -40 | -40 |
| Top slicing | -41 | -41 | -41 | -41 | -41 | -41 | -41 |



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## METAL MINING - Continued

### COSTS - POWER UNITS

### Development

#### Stripping

| Compressed air | Loading | Hauling | Lighting | Shops |
|---|---|---|---|---|
| 6234-23 | 6234-23 | 6234-23 | 6234-23 | 6234-23 |

#### Underground

| Compressed air | Hauling | Hoisting | Ventilation | Lighting | General | Kw.-hr. per foot | Kw.-hr. per ton |
|---|---|---|---|---|---|---|---|
| 6145-17-18 | 6145-18 | 6145-18 | 6145-18 | 6180-10 | 6360-21 | 6138-14 | 6145-17 |
| 6180-10 | 6327-13-14 | 6180-10 | 6360-21 | 6327-13 | | 6284-13 | 6150-10 |
| 6327-13-14 | 6363-21 | 6327-13-14 | 6371-12 | 6480-8 | Timber-ing | 6327-14 | 6151-14 |
| 6360-21 | 6369-27-28 | 6360-21 | 6480-8 | | | 6368-21 | 6180-10 |
| 6368-21 | -29 | 6368-21 | 6515-16 | Pumping | 6368-21 | 6402-11 | 6260-21 |
| 6369-27-28 | 6371-12 | 6369-27-28 | 6736-9-10 | | | 6480-8 | |
| -29 | 6480-8 | -29 | | 6145-17 | Mechan-ical loading | 6661-29 | |
| 6371-12 | 6515-16 | 6371-12 | | 6180-10 | | | |
| 6480-8 | 6736-9-10 | 6490-12 | | 6480-8 | 6480-8 | | |
| 6490-12 | | 6515-15-16 | | | | | |
| 6514-15 | | 6525-11 | | | | | |
| 6515-15-16 | | 6736-9-10 | | | | | |
| 6525-11 | | | | | | | |
| 6709-14 | | | | | | | |
| 6736-9-10 | | | | | | | |



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## METAL MINING - Continued

### COSTS - POWER UNITS - Continued

#### Mining

##### Surface

| Loading | Hauling | Air compressor | Shops | Lighting | Mining |
|---|---|---|---|---|---|
| 6234-23<br>6788-11 | 6234-23<br>6513-12<br>6788-11 | 6234-23 | 6234-23<br>6311-14<br>6368-20 | 6234-23 | 6462-13<br>6666-17 |

##### Dredging

| Operation | Water supply | Per cubic yard |
|---|---|---|
| 6659-16 | 6650-16<br>6660-13 | 6659-16<br>6660-13<br>6788-51 |

##### Underground

| Mining system | Compressed air | Hoisting, hauling | Other | Total |
|---|---|---|---|---|
| Open stope..... | 6785-42-43 | 6785-42-43 | 6785-42-43 | 6785-42-43 |
| Shrinkage..... | -44 | -44 | -44 | -44 |
| Cut-and-fill..... | -45 | -45 | -45 | -45 |
| Square set..... | -46 | -46 | -46 | -46 |
| Undercut block caving | -46 | -46 | -46 | -46 |
| Sublevel caving..... | -47 | -47 | -47 | -47 |
| Top slicing..... | -47 | -47 | -47 | -47 |



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## METAL MINING - Continued

### COSTS - POWER UNITS - Continued

### Mining - Continued

#### Underground - Continued

| Compressed air | Haulage | Hoisting | Pumping | Lighting | Ventilation | Mechanical loading | Total mining |
|---|---|---|---|---|---|---|---|
| 6092-12 | 6092-12 | 6092-12 | 6092-12 | 6092-12 | 6092-12 | 6170-21 | 6119-13 |
| 6113-11 | 6113-11 | 6113-11 | 6113-11 | 6138-13 | 6145-17 | 6239-11 | 6149-16 |
| 6121-11 | 6138-13 | 6121-11 | 6121-11 | 6168-32 | 6159-9 | | 6159-9 |
| 6138-13 | 6170-21 | 6138-13 | 6138-13 | 6170-21 | 6168-32 | | 6168-32 |
| 6145-17 | 6237-20 | 6145-17 | 6145-17 | 6179-14 | 6232-21 | Scraping | 6170-21 |
| 6159-9 | 6239-11 | 6159-9 | 6168-32 | 6180-10 | 6237-20 | | 6179-14 |
| 6168-32 | 6247-41 | 6168-32 | 6170-21 | 6232-21 | 6238-12 | 6138-13 | 6180-10 |
| 6170-21 | 6327-13 | 6170-21 | 6179-14 | 6237-20 | 6239-11 | 6348-12 | 6181-22 |
| 6174-10 | 6348-12 | 6174-10 | 6180-10 | 6238-12 | 6247-41 | 6369-25-26 | 6186-18 |
| 6179-14 | 6369-25-26 | 6179-14 | 6237-20 | 6239-11 | 6286-8 | 6410-48 | 6239-11 |
| 6180-10 | 6380-9 | 6180-10 | 6238-12 | 6286-8 | 6290-18 | 6586-23 | 6240-8 |
| 6232-21 | 6390-7 | 6232-21 | 6247-41 | 6290-18 | 6311-14 | | 6247-41 |
| 6237-20 | 6410-48 | 6237-12-20 | 6290-18 | 6311-14 | 6322-10 | Bulldozing | 6260-21 |
| 6238-12 | 6416-14 | 6239-11 | 6311-14 | 6322-10 | 6348-12 | | 6276-8 |
| 6239-11 | 6586-23 | 6247-41 | 6322-10 | 6327-13 | 6360-21 | 6661-29 | 6284-12 |
| 6247-41 | 6661-29-31 | 6286-8 | 6348-12 | 6348-12 | 6370-15 | | 6286-8 |
| 6286-8 | 6688-56 | 6290-18 | 6368-20 | 6360-21 | 6372-7 | Diamond drill | 6311-14 |
| 6290-18 | | 6311-14 | 6369-25-26 | 6370-15 | 6410-48 | | 6325-11 |
| 6311-14 | | 6322-10 | 6370-15 | 6372-7 | 6440-31 | 6804-35 | 6327-13 |
| 6322-10 | | 6327-13 | 6372-7 | 6380-9 | 6464-13 | | 6348-12 |
| 6327-13 | Tramming | 6348-12 | 6380-9 | 6390-7 | 6470-6 | Saw mill | 6360-21 |
| 6348-12 | | 6360-21 | 6390-7 | 6410-48 | 6515-15 | | 6371-11 |
| 6360-21 | 6092-12 | 6368-20 | 6397-9 | 6440-31 | 6673-15 | 6311-14 | 6372-7 |
| 6361-20 | 6168-32 | 6369-25-26 | 6410-48 | 6464-13 | 6688-56 | 6368-20 | 6377-13 |
| 6368-20 | 6368-20 | 6370-15 | 6416-14 | 6470-6 | 6736-9 | | 6380-9 |
| 6369-25-26 | 6601-30 | 6372-7 | 6440-31 | 6515-15 | 6741-18 | | 6390-7 |
| 6370-15 | 6736-9 | 6380-9 | 6464-13 | 6525-11 | 6804-35 | | 6402-10 |
| 6372-7 | | 6390-7 | 6470-6 | 6543-11 | 6815-35 | Miscel. | 6410-48 |
| 6380-9 | | 6397-9 | 6515-15 | 6601-30 | | 6168-32 | 6416-14 |
| 6390-7 | | 6410-48 | 6525-11 | 6673-15 | | 6179-14 | 6462-13 |
| 6397-9 | | 6416-14 | 6543-11 | 6688-56 | | 6247-41 | 6464-13 |
| 6410-48 | | 6440-31 | 6586-23 | 6736-9 | | 6380-9 | 6490-11 |
| 6416-14 | | 6464-13 | 6601-30 | 6804-35 | | 6390-7 | 6503-8-11 |
| 6440-31 | | 6470-6 | 6656-16 | 6815-35 | | 6410-48 | -15-18-21 |
| 6464-13 | | 6515-15 | 6673-15 | | | 6416-14 | -24-27-29 |
| 6470-6 | | 6525-11 | 6688-56 | | | 6525-11 | 6512-12 |
| 6515-15 | | 6543-11 | 6709-13 | | | | 6515-15 |
| 6525-11 | | 6586-23 | 6736-9 | | | | 6525-11 |



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METAL MINING - Continued

COSTS - POWER UNITS - Continued

Mining - Continued

Underground - Continued

| Compressed air | Haulage | Hoisting | Pumping | Lighting | Ventilation | Mechanical loading | Total mining |
|---|---|---|---|---|---|---|---|
| 6526-20 | | 6601-30 | 6741-18 | | | | 6543-11 |
| 6543-11 | | 6656-16 | 6804-35 | | | | 6565-12 |
| 6565-12 | | 6673-15 | 6815-35 | | | | 6586-23 |
| 6586-23 | | 6688-56 | | | | | 6601-30 |
| 6601-28-30 | | 6709-13 | | | | | 6661-29-31 |
| 6656-16 | | 6736-9 | | | | | 6662-9 |
| 6673-15 | | 6741-18 | | | | | 6666-17 |
| 6688-56 | | 6804-35 | | | | | 6673-15 |
| 6709-13 | | 6815-35 | | | | | 6688-56 |
| 6736-9 | | 6824-3 | | | | | 6736-9 |
| 6741-18 | | | | | | | 6776-19-20 |
| 6804-35 | | | | | | | -21-27 |
| 6815-35 | | | | | | | 6804-35 |
| 6824-3 | | | | | | | 6806-13-14 |
| | | | | | | | 6815-35 |



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## ORE DRESSING

### PLANT EQUIPMENT

| | | | | | | |
|---|---|---|---|---|---|---|
| 6280-12 | 6404-5 | 6408-7 | 6429-11 | 6707-23 | 6730-3 | 6735-6 |

### PLANT RESEARCH

| | | | | | | |
|---|---|---|---|---|---|---|
| 6343-6 | 6467-4 | 6544-9 | 6604-9 | 6658-1-2 | 6706-4-5 | 6739-6 |
| 6358-4 | 6479-4-16 | 6574-3-4 | 6605-1-2 | 6685-11 | -6-7-8 | 3045-4 |
| 6460-24-27 | 6497-3 | -18 | 6616-13 | | -9 | |

### TYPE OF ORE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6236-2 | 6320-2 | 6394-2 | 6460-2 | 6532-2 | 6587-1 | 6658-3 | 3045-1 |
| 6241-2 | 6342-2 | 6404-2-3 | 6467-2 | 6541-1 | 6590-1 | 6685-2 | 3052-1 |
| 6261-2 | 6343-2 | 6408-3 | 6476-2 | 6544-2 | 6600-1 | 6706-3 | |
| 6280-2 | 6353-2 | 6411-1 | 6479-3 | 6550-1 | 6604-3 | 6739-2 | |
| 6285-2 | 6357-1 | 6429-2 | 6489-2 | 6551-1 | 6605-1 | 6742-2 | |
| 6303-2 | 6358-2 | 6430-2 | 6492-2 | 6555-2 | 6612-1 | 6758-2 | |
| 6314-3 | 6359-2 | 6433-1 | 6497-3 | 6573-1 | 6619-2 | 6759-2 | |
| 6319-3 | 6364-2 | 6447-2 | 6508-1 | 6574-2 | 6624-1-4 | | |

### ORE ANALYSES

| | | | | | | |
|---|---|---|---|---|---|---|
| 6241-2 | 6379-1 | 6447-2 | 6508-1-11 | 6573-4-5 | 6590-1-3 | 6739-2-3 |
| 6261-17 | 6404-3-22 | 6460-1 | 6550-2 | -6-7 | 6600-1 | 6742-2 |
| 6314-2-47 | 6408-4 | 6467-2 | 6551-1 | -12-29 | 6605-2 | 6759-2 |
| 6343-4 | 6429-2 | 6476-8 | 6555-2 | 6574-3 | 6658-4 | 2998-2 |
| 6358-3 | 6430-2 | 6479-3 | 6573-1-3 | 6587-9 | 6706-3 | |

### PLANT CAPACITY

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6236-2 | 6320-4 | 6359-1 | 6429-1 | 6492-2 | 6555-3 | 6600-1-14 | 6706-1 |
| 6241-1 | 6342-1 | 6364-2 | 6433-1 | 6497-1 | 6573-3-4 | 6604-1 | 6730-1-4 |
| 6261-5 | 6343-12-13 | 6379-1 | 6447-1-3 | 6508-1-3 | -5-6-7 | 6605-1-3 | 6739-1 |
| 6280-1-8 | 6353-3 | 6394-1 | 6460-1 | 6532-1 | -19 | 6619-1 | 6742-4 |
| 6285-1 | 6358-2 | 6404-1-2 | 6467-1 | 6541-1 | 6574-2 | 6624-2-6 | 6758-1 |
| 6303-19 | 6357-6 | 6408-3 | 6479-2 | 6550-1 | 6587-2-9 | 6626-5 | 6788-5-51 |
| 6314-50 | 6358-10 | 6411-2 | 6489-1 | 6551-1 | 6590-1-3 | 6685-1 | 6824-6 |

### SAMPLING EQUIPMENT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6314-44-45 | 6394-13 | 6447-8 | 6489-8 | 6551-8 | 6605-16 | 6685-6-9 | Float-and-Sink |
| 6320-5 | 6404-19 | 6467-8-18 | 6492-5 | 6555-8 | 6608-6 | 6706-14 | 6658-5-6 |
| 6359-11 | 6429-9 | 6476-10 | 6508-8 | 6587-8 | 6624-23 | 6739-3 | |
| 6379-3-5 | 6430-9 | 6479-18 | 6532-8 | 6604-8 | 6658-5-6 | | |



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## ORE DRESSING - Continued

### SAMPLING

| Heads | | | Concentrates | | Tails | | |
|---|---|---|---|---|---|---|---|
| 6261-16 | 6447-8 | 6587-2-8 | 6285-15 | 6503-8 | 6241-19 | 6460-23 | 6624-22 |
| 6280-6 | 6460-8-22 | 6590-2 | 6319-15 | 6544-10 | 6285-15 | 6467-13-18 | 6658-30 |
| 6285-15 | 6467-18 | 6600-12 | 6342-11 | 6550-18 | 6303-12 | 6476-10 | 6742-14 |
| 6314-43 | 6476-10 | 6619-15 | 6343-19 | 6555-8 | 6314-43 | 6479-18 | |
| 6319-5-14 | 6479-18 | 6624-22 | 6353-7 | 6573-16 | 6319-15 | 6489-8 | |
| 6320-5 | 6489-8 | 6658-30 | 6364-8 | 6574-16 | 6343-19 | 6492-11 | |
| 6353-7 | 6492-5 | 6685-6 | 6394-13 | 6600-13 | 6353-7 | 6508-9 | |
| 6358-28 | 6497-7 | 6739-3 | 6447-8 | 6619-15 | 6358-28 | 6544-10 | |
| 6359-3-10 | 6508-8 | 6742-14 | 6460-23 | | 6359-10 | 6550-17 | |
| 6364-8-19 | 6544-10 | 6759-8 | 6467-18 | | 6364-8 | 6551-8 | |
| 6379-3 | 6550-17 | 6824-9 | 6476-10 | | 6379-5 | 6555-8 | |
| 6394-13 | 6551-8 | | 6479-18 | | 6394-13 | 6574-10-16 | |
| 6404-19 | 6555-8 | | 6489-8 | | 6404-19 | 6600-13 | |
| 6429-5-9 | 6574-16 | | 6497-7 | | 6433-4 | 6619-15 | |

| Flotation | | Crushed ore | Bullion | Pulp | Classifier | Jig | Filter |
|---|---|---|---|---|---|---|---|
| 6319-15 | 6411-6 | 6303-6 | 6433-4 | 6241-19 | 6433-2 | 6342-11 | 6241-20 |
| 6342-11 | 6429-9 | 6404-19 | 6787-86 | 6320-7 | 6574-16 | Settling tank | |
| 6358-28 | 6430-8 | 6479-18 | 6824-11 | | | 6429-8 | |
| 6379-6-7 | 6619-15 | | | | | | |

### FLOW SHEETS

| | | | |
|---|---|---|---|
| 6236-2 | 6404-6-8 | 6551-2 | 6730-4 |
| 6241-5-25 | 6408-6-8-14-16-26 | 6555-4 | 6735-11 |
| 6261-4-6-22 | 6411-2 | 6573-2-4-6-8 | 6739-2-18 |
| 6280-11 | 6429-4-6-8 | 6574-4 | 6742-4-6-8 |
| 6285-4-19 | 6430-4 | 6587-2-4-12 | 6757-21 |
| 6303-4-30 | 6433-7 | 6590-2-6 | 6758-4-14 |
| 6314-4-42 | 6447-2 | 6591-13 | 6759-8 |
| 6319-4-21 | 6460-6-8-10-18-36 | 6600-2-4-16 | 6788-16 |
| 6320-8-19 | 6462-15 | 6604-4 | 6800-20-24-32 |
| 6342-4-14 | 6467-2-8-30 | 6605-24 | 6824-12 |
| 6343-10-11-12 | 6476-2-12 | 6612-14 | |
| 6353-10 | 6479-6-8-12-26 | 6619-6 | |
| 6357-2 | 6489-2-4 | 6624-2-6-28 | |
| 6358-4-10-16-38 | 6497-4-14 | 6658-8-16-26-30 | |
| 6359-2-16 | 6508-2 | 6659-17 | |
| 6364-4-8-22 | 6532-4 | 6685-2 | |
| 6379-2-6-12 | 6544-2-4-8-10 | 6706-22 | |
| 6394-2-4-10 | 6550-2-23 | 6707-29 | |



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## ORE DRESSING - Continued

### MILLING DETAILS

### Crushing

#### Primary

| Mine or pit | Jaw | | | Gyratory | | Rolls | Disintegrator |
|---|---|---|---|---|---|---|---|
| 6241-5 | 6236-3 | 6433-2 | 6736-13 | 6241-5 | 6550-5 | 6241-5 | 6532-4 |
| 6314-30 | 6280-3 | 6447-3 | 6739-3 | 6261-4 | 6555-4 | 6342-4-5 | |
| 6368-18 | 6285-6 | 6460-3-6 | 6741-2 | 6303-6 | 6573-2 | 6460-7 | |
| 6394-4 | 6314-10-12 | 6476-3 | 6742-6 | 6314-8-10 | 6600-3 | | |
| 6408-5 | -13-30 | 6489-3 | 6776-30 | 6320-4 | 6624-6 | | Dust |
| 6412-16 | 6319-5 | 6497-4 | 6792-19 | 6358-12 | 6658-8-9 | Stamps | recovery |
| 6447-3 | 6342-3 | 6508-3 | 6800-21-25 | 6379-2 | 6758-4 | 6364-3 | 6358-3 |
| 6605-3 | 6343-9 | 6532-5-6 | 6804-27 | 6404-7 | 6776-30 | 6408-2-6 | |
| 6619-6 | 6353-3-5 | 6551-4 | 6824-9 | 6408-5-6 | | | |
| 6706-5 | 6359-3 | 6574-5 | | 6460-3 | | | |
| | 6364-3 | 6587-2 | | 6467-5 | | | |
| | 6404-7 | 6590-2 | | 6479-5-6 | | Cone | |
| | 6408-5 | 6604-4-5 | | -9 | | 6573-8 | |
| | 6411-2 | 6619-6 | | 6492-4 | | 6792-19 | |
| | 6429-3 | 6624-6 | | 6541-1 | | | |
| | 6430-4 | 6685-6 | | 6544-4 | | | |

#### Secondary

| Rolls | | | Cone | | Gyratory | Disk | Stamps |
|---|---|---|---|---|---|---|---|
| 6236-6 | 6489-3 | 6619-7 | 6236-5 | 6544-4 | 6236-3-5 | 6261-5 | 6364-5 |
| 6241-9-10 | 6492-4 | 6624-3-14 | 6314-9-13 | 6573-6-7 | 6303-6 | 6303-6 | 6476-3 |
| 6280-3 | 6497-4 | 6658-8-9 | -30 | 6587-2 | 6358-12 | 6314-30 | 6479-6 |
| 6285-6 | 6541-2 | 6685-6-7 | 6319-5 | 6590-2 | 6404-7 | 6343-9 | 6800-22 |
| 6314-9-11 | 6544-4 | 6736-13 | 6359-3 | 6619-7 | 6508-3 | 6358-12 | |
| -12-30 | 6550-5-6 | 6739-3 | 6394-4 | 6706-5-11 | 6550-5 | 6379-2 | |
| 6320-4 | 6555-6 | 6758-4 | 6411-2-3 | 6739-4 | 6574-6 | 6404-7 | Jaw |
| 6342-4 | 6573-2-6 | 6792-21 | 6430-5 | 6776-30 | 6736-13 | 6460-3 | |
| 6343-9 | -7 | 6776-30 | 6447-3 | | 6741-2 | 6467-5-6 | 6550-5 |
| 6353-3 | 6574-6 | | 6460-3-4 | | 6600-3-10 | 6658-8-9 | 6555-6 |
| 6394-4 | 6590-2 | | -7 | | 6624-7 | 6739-4 | 6685-6 |
| 6433-2 | 6600-4-5 | | 6479-6-9 | | 6742-6 | 6776-30 | Comminu- |
| 6467-5-9 | 6604-4-5 | | 6489-3 | | 6776-30 | | tor |
| 6479-6-10 | -6 | | 6532-6 | | | | 6739-4 |



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ORE DRESSING - Continued

MILLING DETAILS
(Continued)

Grinding

| Ball mills | | | Rod mills | Pebble mills | Tube mills | Chilean mills | rolls |
|---|---|---|---|---|---|---|---|
| 6236-7-10 | 6411-3 | 6600-8-11 | 6261-6 | 6357-9 | 6319-10 | 6364-8 | 6280-3 |
| 6241-9-10 | 6430-5 | 6605-4 | 6358-10-12 | 6364-6-8 | 6408-9 | 6479-6 | 6342-7 |
| 6261-7 | 6433-2 | 6619-8-13 | -14 | 6379-4 | 6476-6 | 6573-2 | 6379-3-5 |
| 6283-4-5 | 6460-5-11 | 6685-8 | 6379-4 | 6408-9 | 6508-4 | 6739-7 | -9 |
| 6314-10-16 | 6467-10-14 | 6736-13 | 6394-5 | 6460-5 | 6541-3 | | |
| -17-18-19 | 6479-12-16 | 6739-4 | 6404-8 | 6467-10 | 6550-9 | | |
| -20-21-30 | 6489-5 | 6742-7 | 6408-8 | 6573-2 | 6741-2 | | |
| 6319-6 | 6492-6 | 6757-3 | 6447-4 | 6757-3 | 6757-3 | | Huntington |
| 6320-5 | 6497-5 | 6758-5 | 6467-10-12 | | | | 6460-3 |
| 6342-4-9 | 6508-3 | 6759-3 | 6492-6 | | | | |
| 6343-14 | 6544-5 | 6776-30-33 | 6574-7 | | | | Hadsel |
| 6353-4-5 | 6550-7 | 6792-6-22 | 6658-11-12 | | | | 6792-10 |
| 6357-9 | 6551-5 | 6824-9 | -13-17 | | | | |
| 6359-4 | 6555-6 | | 6706-5-11 | | | | |
| 6364-6 | 6573-3-9 | | 6757-3 | | | | |
| 6379-4 | -10-11 | | 6776-30-33 | | | | |
| 6394-6 | 6587-3-5 | | | | | | |
| 6404-8-11 | 6590-2 | | | | | | |

Washing

| | | | | | | |
|---|---|---|---|---|---|---|
| 6280-6 | 6429-3 | 6541-3 | 6612-11-12 | 6659-10-11 | 6660-10-13 | 6788-8-10 |
| 6364-6 | 6462-10 | 6600-3 | 6619-6-7 | -13 | | -29-76 |

Conveying

Feeders

| Apron | | Pan | Bin gate | Cylinder | Belt | Shaking | Screw |
|---|---|---|---|---|---|---|---|
| 6236-3-7 | 6544-4 | 6261-6 | 6280-3 | 6285-5 | 6285-7 | 6364-7 | 6280-4-5 |
| 6241-9-10 | 6658-8 | 6358-11-22 | 6364-13 | 6343-12 | 6314-12 | 6408-6 | 6379-8 |
| 6319-5-6 | 6706-11 | 6379-2-3 | 6379-3 | 6394-4 | 6359-4 | 6587-3 | |
| 6358-10 | 6742-6 | 6447-3-4 | 6411-2 | 6460-7 | 6574-7 | 6590-2 | Disk |
| 6359-3 | 6758-4 | 6467-12-19 | 6476-3 | 6492-6 | 6604-6 | 6604-5-7 | 6314-9-11 |
| 6394-5 | | -21 | 6492-4 | 6550-5-19 | 6658-11 | | 6800-22 |
| 6404-7-17 | Grizzly | 6550-2-5 | 6550-19 | 6573-8 | 6758-5 | Scoop | Tray |
| -18 | | -19 | 6600-3 | 6600-3 | 6759-3 | | |
| 6408-5 | 6541-1 | 6555-4 | 6604-5 | 6619-6 | | 6285-7 | 6379-3 |
| 6429-3 | | 6573-8 | 6619-6 | 6706-11 | | 6447-4 | |
| 6430-4 | Plunger | 6574-5 | 6658-8 | | Pot | 6467-12 | Car dump |
| 6460-7 | | 6605-4 | 6685-6 | | | | |
| 6479-9-10 | 6600-4-11 | 6685-6 | | | 6236-9 | | 6479-9 |
| 6492-4 | | | | | | | |



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## ORE DRESSING - Continued

### MILLING DETAILS - Continued

#### Conveying - Continued

##### Conveyors

**Belt**

6236-3
6241-9-18
6261-4-5
-6
6280-3-4
6285-6
6303-6
6314-8-10
-13-16-22
-24-26-28
6319-5-8
6342-11
6343-12-18
6357-8
6358-12-22
6359-3
6379-2-3
6394-4
6404-7-8
-17-18
6408-5
6411-2-3
6429-4
6430-4-5
6433-2
6447-3-4
6460-6-7
-8-19
6467-5-9
-19-30
6479-9-10
-19
6489-7
6492-5-6
-13
6532-4-5
6541-2
6544-9-10
6550-19
6551-5-11
6555-4
6573-8-9
6574-6-7
-14-16
6587-2
6590-2
6600-3-4
-11
6619-7-14
-16
6621-2
6624-17
6658-21-23
6685-6
6706-11
6736-13
6739-4
6742-6
6758-4
6759-3
6824-9

**Sorting**

6236-3-4
6359-3
6429-3
6430-5
6532-6
6555-4
6587-2
6600-3

**Belt cleaner**

6600-11

**Pump**

6241-18
6280-6
6303-9-19
6314-23-24
-25
6319-12
6320-8
6342-9
6343-17
6357-7-9
6358-11-23
-24
6364-9-16
6379-4-6
-7
6394-5-9
6404-19
6429-8
6430-7
6447-2-4
6460-21
6467-11-15
-16-17
6479-14
6489-5
6492-10-12
6497-6
6508-6
6532-1
6541-3
6544-9
6550-12-13
6551-11
6555-7
6573-16-18
6574-10-11
-12-13
6587-6
6600-8-11
6604-8
6605-13
6619-16
6658-24
6706-12-13
-14
6739-9
6742-7-13

**Launder**

6236-7
6241-18
6280-5-6
6285-14
6314-42
6319-8-9
-12
6342-10
6343-15-17
6353-6
6357-8-9
6358-10-17
6359-9
6364-7-13
-17
6379-4-5
6394-12
6404-15-16
-18
6408-10-13
6429-4
6460-19
6467-10
6476-6-10
6489-8
6492-7
6508-8
6544-10
6550-16
6551-5-8
-11
6574-7-8
6600-5-13
6604-8
6605-5
6619-7
6658-25

**Sluice**

6460-21
6551-10
6600-13
6787-65
6788-8

**Distributors**

6605-5
6658-11
6706-12
6759-4

**Wood pipe**

6343-18
6394-12
6447-2
6489-8
6573-16-17
-18
6600-13

**Rubber-lined pipe**

6544-10

**Chute**

6236-4
6319-5

**Chute lining**

6236-4
6280-6
6492-5-7
6604-8

| Pan | Screw | Apron | Drag | Agitators | Box-car loaders | Pneumatic |
|---|---|---|---|---|---|---|
| 6404-7-17 | 6379-8-9 | 6280-3 | 6739-7 | 6319-12 | 6574-16 | 6429-8 |
| 6460-5 | 6604-7 | | | 6605-7-8 | 6605-14 | |
| 6467-19 | | | | -9 | | |
| 6741-2 | | | | | | |



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## ORE DRESSING - Continued

## MILLING DETAILS - Continued

### Elevating

| Bucket and belt | | | | | | Pump | Air lift |
|---|---|---|---|---|---|---|---|
| 6236-6-10 | 6353-6 | 6467-9-20 | 6541-1-2 | 6600-4 | 6758-4 | 6236-11 | 6404-19 |
| 6241-9-10 | 6358-23 | -30 | 6544-9 | 6604-5-6 | 6759-3 | 6261-15 | 6759-4 |
| -18 | 6379-2-3 | 6479-10-12 | 6550-16-19 | -7 | | 6314-25-27 | |
| 6280-3-4 | -4-5 | -17-19 | 6551-4-11 | 6619-7 | | 6319-12 | |
| 6314-9-11 | 6394-4-5 | 6489-3 | 6555-6-8 | 6624-19 | | 6358-27 | Sand wheel |
| -17-22-25 | 6404-19 | 6492-4 | 6574-6-8 | 6658-11-24 | Chain | 6359-5 | |
| 6319-7 | 6433-2 | 6497-4 | 6587-3-6 | 6685-6 | 6379-8 | 6467-12 | 6364-17 |
| 6342-7-8 | 6460-8 | 6532-5-6 | 6590-2 | 6742-6 | 6492-4-14 | 6492-6-8 | |

### Sizing

#### Grizzlies

| Mine bar | | Mill bar | | | | Mechanical | Ring |
|---|---|---|---|---|---|---|---|
| 6241-5 | 6467-5 | 6236-3 | 6404-7 | 6489-3 | 6619-7 | 6492-4 | 6358-12 |
| 6261-4 | 6497-4 | 6280-3 | 6408-5 | 6497-4 | 6685-6 | 6574-6 | |
| 6280-2 | 6550-2 | 6303-6 | 6411-2 | 6508-3 | 6736-13 | 6600-3 | |
| 6342-3 | 6573-8 | 6314-8-10 | 6430-4 | 6550-5 | 6742-6 | | |
| 6358-11 | 6574-4 | -12-13 | 6447-3 | 6551-4 | 6758-4 | Disk | |
| 6408-5 | 6619-6 | 6319-5 | 6460-3-4 | 6555-4-6 | 6824-9 | | |
| 6429-1 | 6660-9 | 6353-3 | -6 | 6573-2-8 | | 6532-6 | |
| 6430-4 | 6668-37 | 6358-12 | 6467-5 | 6574-5 | | 6541-1 | |
| 6433-2 | 6806-7 | 6359-3 | 6476-3 | 6600-3 | | | |
| 6460-2 | | 6364-3 | 6479-5-9 | 6604-5 | | | |

#### Screens

| Trommel | | | Vibrator | | | Stationary | Belt |
|---|---|---|---|---|---|---|---|
| 6236-10 | 6544-5 | 6800-25 | 6236-4-6 | 6497-4 | 6706-5-11 | 6241-5 | 6280-3 |
| 6280-3 | 6555-6 | 6806-7 | 6241-5 | 6532-6 | 6739-4-5 | 6285-6 | 6319-8 |
| 6314-8-10 | 6573-2 | | 6314-14 | 6541-2 | 6741-2 | 6303-6 | 6573-2 |
| -12 | 6587-3 | | 6342-4-5 | 6544-4 | 6742-6 | 6357-6-7 | 6604-4-6 |
| 6353-3-4 | 6600-4-10 | | 6379-5 | 6550-6 | 6758-4 | -8 | Impact |
| 6379-3-9 | 6604-4-6 | | 6394-4 | 6573-9 | | 6379-2 | |
| 6408-5 | 6612-11 | | 6411-3 | 6574-6 | Stamp screens | 6460-5 | 6241-9-10 |
| 6429-3 | 6624-7-8 | | 6430-4 | 6587-2 | | 6532-6 | 6314-13 |
| 6460-3 | -9 | | 6447-3 | 6590-2 | 6364-5 | 6624-7-8 | 6479-9-10 |
| 6462-10 | 6659-10 | | 6460-4-5 | 6600-3-8 | 6408-8 | 6739-4 | |
| 6467-6 | 6660-9 | | -6-8 | 6619-7 | 6476-3 | 6806-7 | Shaking |
| 6497-4 | 6685-6 | | 6467-5-9 | 6624-9 | | | |
| 6508-3-4 | 6788-14-50 | | 6489-3 | 6658-8-11 | | | 6261-5 |
| 6532-4 | -58 | | 6492-4 | -20-21 | | | 6429-4 |



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## ORE DRESSING - Continued

### MILLING DETAILS - Continued

#### Sizing - Continued

##### Classifiers

| Drag | | | | Bowl | | Hydraulic | Cone |
|---|---|---|---|---|---|---|---|
| 6241-9 | 6364-9 | 6489-5 | 6587-3 | 6241-9-10 | 6541-3 | 6236-9 | 6285-14 |
| 6261-7-8 | 6379-4-5 | 6492-6 | 6590-2 | 6261-7-8 | 6573-7-9 | 6314-15 | 6342-5 |
| 6285-8-13 | 6408-8-9 | 6497-5 | 6600-11 | 6314-16-17 | -10-11 | 6479-6 | 6353-3 |
| 6314-14-15 | 6411-4 | 6508-4 | 6605-4-5 | -20-21 | 6619-13 | 6573-2 | 6408-13 |
| -18-19 | 6430-5 | 6541-2 | 6619-7-8 | 6343-15 | 6736-14 | 6619-14 | 6742-7-8 |
| 6319-9 | 6432-2 | 6544-5 | -13 | 6358-10-11 | 6739-8-9 | 6658-11-14 | |
| 6320-6 | 6447-4 | 6550-7-8 | 6706-5-11 | -13-16 | | -15 | Jig |
| 6342-5 | 6460-11-12 | -9 | -13 | 6394-5-6 | | 6741-2 | |
| 6343-15 | -19 | 6551-5 | 6736-14 | 6404-8-9 | | | 6364-7 |
| 6353-4 | 6467-15-17 | 6555-6 | 6742-7 | 6460-5-11 | | | |
| 6357-7-8 | 6476-6 | 6573-3-9 | 6758-5-6 | -12 | | | |
| 6358-10 | 6479-6-12 | -11 | 6759-3 | 6467-10 | | | |
| 6359-4 | -16 | 6574-7 | | 6479-6-12 | | | |

##### Screen Analyses

| Mill | | Crushers | | | | | |
|---|---|---|---|---|---|---|---|
| Heads | Tails | Primary | | Secondary | | Cone | Disk |
| 6429-2 | 6303-21 | 6285-9 | 6550-7 | 6236-6 | 6550-7 | 6394-5 | 6343-9 |
| 6590-5 | 6320-12 | 6314-34-36 | 6551-4 | 6241-6 | 6573-10 | 6404-25 | 6379-9 |
| 6600-6 | 6358-26-33 | 6320-4-12 | 6574-19 | 6261-5 | 6574-19 | 6447-11 | 6658-10 |
| 6605-4 | 6379-10 | 6343-23 | 6590-5 | 6314-34 | 6600-11 | 6479-11 | 6776-30 |
| 6706-16 | 6447-11 | 6359-3 | 6658-10 | 6320-12 | 6658-10 | 6587-3 | |
| | 6460-17-20 | 6379-9 | 6706-16 | 6343-9-23 | 6742-7 | 6590-5 | Stamp |
| | -27 | 6404-25 | 6742-7 | 6353-13 | | 6619-18 | |
| Tails(con.) | 6467-26 | 6460-7 | 6776-30 | 6359-4 | | 6739-4-13 | 6476-7 |
| 6605-20 | 6476-7 | 6467-21 | | 6404-25 | | | |
| 6658-34 | 6497-11 | 6479-11 | | 6460-7-8 | | | Comminu-tor |
| 6742-13 | 6573-14 | 6541-2 | | 6467-21 | | | |
| | 6600-7 | 6544-4-7 | | 6544-4-7 | | | 6739-13 |



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ORE DRESSING - Continued

MILLING DETAILS - Continued

Sizing - Continued

Screen Analyses - Continued

| Crushing - rolls | | Grinders | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Ball mills | | Rod mill | | Tube mill |
| 6285-9 | 6739-13 | 6236-9 | 6430-12 | 6605-5 | 6261-9 | 6658-12-17 | 6508-10 |
| 6343-9 | 6776-30 | 6261-10 | 6467-23 | 6619-18 | 6358-13-14 | 6706-16 | 6550-11 |
| 6394-5 | | 6314-34-35 | 6479-14 | 6742-7-10 | -33 | 6776-32 | |
| 6479-11 | | -36 | 6492-15 | 6758-6 | 6394-8 | | |
| 6541-2 | | 6320-12 | 6508-10 | 6759-4 | 6404-25 | Pebble mill | |
| 6544-5 | | 6342-4-9 | 6544-7 | 6776-32-33 | 6408-11 | | Chilean |
| 6550-7 | | 6343-22 | 6550-10 | | 6447-11 | 6364-22 | 6739-13 |
| 6574-19 | | 6353-5-8 | 6551-5 | | 6467-23 | 6408-11 | |
| 6590-5 | | 6394-8 | 6555-9 | | 6492-15 | | |
| 6658-10 | | 6411-4 | 6590-5 | | 6574-20 | | |

| Screens | | Classifiers | | | | | |
|---|---|---|---|---|---|---|---|
| Vibrator | Trommel | Drag | Bowl | General | | | Jig |
| 6550-7 | 6544-7 | 6261-9 | 6261-10 | 6314-35-36 | 6430-12 | 6658-12-15 | 6314-34 |
| 6574-19 | | 6285-9 | 6358-33 | 6319-16 | 6508-10 | 6706-16 | 6342-7 |
| 6590-5 | Stamp | 6447-11 | 6467-22 | 6320-12 | 6544-7 | 6739-13 | 6353-8 |
| 6739-13 | | 6467-22 | 6508-10 | 6343-22 | 6550-10 | 6758-6 | 6364-22 |
| 6742-7 | 6364-6-22 | | Cone | 6358-14-33 | 6551-5 | 6759-4 | 6379-10 |
| | 6408-11 | | | 6404-25 | 6555-9 | | 6600-6 |
| | | | 6476-7 | 6408-11 | 6574-21 | | |
| | Belt | | 6742-10 | 6411-4 | 6605-5 | | |
| | 6319-16 | | | | | | |

| Table | Flotation | | | | | Amalgamation | Leaching |
|---|---|---|---|---|---|---|---|
| 6314-34 | 6241-14 | 6320-12 | 6404-22-25 | 6544-6-7 | 6600-10 | 6408-11 | 6303-8 |
| 6319-16 | 6261-14 | 6342-10 | 6411-5-6 | 6550-15 | 6619-18 | | -12 |
| 6353-8 | 6285-9-12 | 6343-23 | 6430-11-12 | 6555-9 | 6658-18-34 | | 6364 |
| 6364-22 | 6314-34-35 | 6364-22 | 6447-11-12 | 6573-13 | 6758-6 | Cyanidation | -22 |
| 6460-10 | -36 | 6379-11 | 6460-14-16 | 6587-4 | 6759-4 | | 6739-9 |
| 6658-11-34 | 6319-16 | 6394-10-11 | 6489-6 | 6590-5 | | 6408-11-15 | Roasting |
| | | | | | | | 6739-13 |



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## ORE DRESSING - Continued

### MILLING DETAILS - Continued

### Concentration

#### Dry

| Hand | | | Magnetic | | Pneumatic | Condensation | Dust collection |
|---|---|---|---|---|---|---|---|
| 6359-3 | 6656-13 | 6236-6 | 6358-12 | 3045-5 | 6280-4 | 6429-7 | 6759-7 |
| 6364-7 | 6673-8 | 6261-5 | 6361-18 | 3052-7 | 6787-78 | | |
| 6429-3 | 6776-30 | 6280-1-4 | 6379-2 | | | | |
| 6447-2-3 | 6806-7 | -5 | 6532-5-7 | | | | |
| 6544-8 | | 6285-6 | 6604-4-7 | | | | |
| 6600-3 | | 6303-6 | 6624-10 | | | | |

#### Wet

| Practice | | Flotation blowers | Reagents | | Tables | Jigs | Sluices |
|---|---|---|---|---|---|---|---|
| 6236-11 | 6550-12 | 6261-13 | 6236-11 | 6590-4 | 6236-9 | 6314-14 | 6612-11 |
| 6241-11 | 6551-5 | 6285-13 | 6241-9-11 | 6600-8 | 6280-1-4 | 6342-5-6 | 6659-10 |
| 6261-13 | 6555-7 | 6319-11 | 6261-4 | 6604-9 | 6314-15-18 | -8 | 6660-9 |
| 6285-4-9 | 6573-3-7 | 6343-16 | 6319-11 | 6605-6-7 | -19-20 | 6353-3-4 | 6787-65 |
| -12 | -10-11-15 | 6358-19 | 6320-6-7 | -9-10-11 | 6319-8 | 6364-6-8 | 6788-5-9 |
| 6314-21-22 | 6574-8-10 | 6359-7 | 6343-16 | 6619-10 | 6342-8 | 6373-3-5 | -14-58 |
| -23-25-26 | -13 | 6364-10 | 6353-5 | 6658-18 | 6353-4 | 6460-3-5 | |
| -27-38 | 6587-4 | 6394-9 | 6358-20 | 6685-12 | 6357-9 | 6476-5 | |
| 6319-10 | 6590-4 | 6404-8-13 | 6359-6 | 6706-5-6 | 6364-8 | 6479-6 | |
| 6320-6 | 6600-8-11 | 6411-5 | 6364-9 | -7-8 | 6429-4 | 6532-5-6 | Riffles |
| 6342-9 | 6604-9 | 6429-8 | 6379-7 | -12-13 | 6433-4 | 6600-4 | 6612-11 |
| 6343-15 | 6605-6 | 6430-7 | 6394-9 | 6742-8 | 6447-8 | 6685-6-7 | 6659-9 |
| 6353-5 | 6619-9-13 | 6447-4 | 6404-9-13 | 6758-8 | 6460-3-5 | 6776-36 | 6660-9 |
| 6358-10-11 | 6658-17-18 | 6460-18 | 6411-5 | 6759-4 | -9-20 | 6792-2 | 6787-69 |
| -17 | 6685-11-12 | 6467-14 | 6429-9 | 6792-4 | 6476-6 | | 6788-9-14 |
| 6359-5 | 6706-5-8 | 6479-15 | 6430-6 | | 6479-6 | | -50 |
| 6364-9 | -12 | 6489-5 | 6447-5-6 | | 6492-9-14 | | |
| 6379-6 | 6736-14 | 6492-9 | 6460-17 | 3112-1 | 6532-5-7 | | |
| 6394-9 | 6739-3 | 6497-5 | 6467-13 | | 6573-2-15 | | |
| 6404-12 | 6741-2 | 6544-8 | 6469-6 | | 6604-4-6 | Vanners | Launder |
| 6411-4 | 6742-7-8 | 6551-6 | 6479-15-16 | Feeders | 6605-6-9 | 6314-41 | 6619-13 |
| 6430-5-7 | 6758-6 | 6555-7 | 6489-6 | 6447-7 | 6658-11-16 | 6460-3 | |
| 6447-4-6 | 6759-4 | 6574-9-12 | 6492-8-13 | 6492-9 | -17 | 6476-6 | |
| 6460-5-12 | 6776-36 | 6600-12 | 6497-5 | 6600-9 | 6685-7-8 | 6479-6 | |
| -15 | 6792-2-26 | 6605-16 | 6544-9 | 6619-11-12 | 6708-9 | | |
| 6462-11 | 6800-20-24 | 6619-10 | 6550-13 | 6706-14 | 6739-7 | | |
| 6467-6-12 | | 6658-19 | 6551-6 | 6758-7 | 6776-36 | | |
| -24 | 2998-3 | 6706-12 | 6555-7 | 6759-5 | 6788-5-9 | Classifier | Centrifuge |
| 6479-14 | 3045-7 | 6758-8 | 6573-3-5 | | -14-50-58 | | |
| 6489-5 | | 6759-5 | 6574-10-11 | | 6792-2-32 | 3045-5 | 6788-9-14 |
| 6492-8 | | | -13 | | 3045-5 | | |
| 6544-8 | | | 6587-5-6-7 | | 3052-14 | | |



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ORE DRESSING - Continued

MILLING DETAILS - Continued

Concentration - Continued

Ratios

| General ratios | | | | Flotation | Table | Leaching | Calculation |
|---|---|---|---|---|---|---|---|
| 6280-8 | 6497-9 | 6574-11-13 | 6730-4 | 6236-12 | 6236-12 | 6303-22 | 6404-20 |
| 6314-46-50 | 6532-10 | -14-27 | 6742-5-14 | 6261-4 | 6280-8 | | 6430-9 |
| 6319-18 | 6550-18 | 6587-9 | 6758-11 | 6285-16-17 | 6460-9 | | |
| 6430-13 | 6551-13 | 6604-11 | | 6314-46-50 | | | |
| 6467-27 | 6555-10 | 6605-14 | | 6411-4 | | | |
| 6479-21 | 6573-3-4 | 6619-22 | | 6447-14 | | | |
| 6489-11 | -5-8 | 6685-14 | | 6551-7-11 | | | |
| 6492-15 | -12-20 | 6706-21 | | | | | |

Dewatering

| Thickeners | | | | Filtration | | | |
|---|---|---|---|---|---|---|---|
| Tanks | | Cones | Classifier | Filters | | Vacuum pump | Driers |
| 6236-10 | 6497-4 | 6241-16 | 6319-12 | 6241-16 | 6551-7 | 6447-9 | 6280-4 |
| 6261-15 | 6544-10 | 6280-4 | 6404-15 | 6261-15 | 6555-8 | 6460-19 | 6379-8 |
| 6280-5 | 6550-15-16 | 6342-5-6 | 6460-19 | 6285-13-14 | 6573-16 | 6467-16 | 6429-9 |
| 6285-13 | 6551-7 | 6364-16 | 6467-10-17 | 6314-15-22 | 6574-14 | 6479-17 | 6532-5 |
| 6314-28 | 6555-8 | 6408-7-9 | 6497-4-5 | -24-25-27 | 6587-6 | 6489-7 | 6551-7 |
| 6319-12 | 6573-11-16 | 6476-6 | 6532-5-7 | -28-42 | 6590-4 | 6492-11 | 6574-15 |
| 6320-8 | 6587-5-6 | 6550-16 | 6544-9-10 | 6320-8 | 6600-3-12 | 6497-7 | 6604-7 |
| 6342-5-8 | 6590-4 | 6573-2 | 6550-16 | 6342-9 | 6605-13 | 6541-4 | 6624-9 |
| -9 | 6600-5-8 | 6604-6 | 6551-7 | 6343-17 | 6619-14 | 6550-16 | 6685-8 |
| 6343-17-18 | -12 | 6685-8 | 6587-5 | 6353-5-6 | 6658-26-27 | 6551-7 | 6759-7 |
| 6353-5 | 6604-8 | | 6600-3 | 6358-11-25 | 6706-13 | 6555-8 | |
| 6358-25 | 6605-13 | | 6604-8 | 6359-9 | 6736-14 | 6574-14 | |
| 6359-9 | 6619-13-14 | | | 6364-10-16 | 6742-13 | 6587-7 | |
| 6364-8-9 | 6658-20-27 | Box | | -18 | 6758-9 | 6600-12 | |
| -18 | 6685-7-8 | 6357-9 | | 6379-8 | 6759-7 | 6605-17 | |
| 6379-4-5 | 6706-13 | 6379-8 | | 6394-11 | | 6619-14 | |
| -6-8 | 6736-14 | | | 6404-8-16 | | 6658-26-28 | |
| 6394-11 | 6742-13 | | | 6411-4-5 | Tank | 6758-12 | |
| 6404-8-16 | 6758-7-9 | Tray | Drag | 6429-9 | 6364-13 | 6759-7 | |
| 6408-13 | 6759-7-8 | | | 6430-7 | 6404-15 | | |
| 6411-4 | 6824-9 | 6467-16 | 6342-5-6 | 6447-9 | 6408-14 | | |
| 6429-8 | | 6541-3 | -7-8-11 | 6460-19 | 6467-16 | | |
| 6430-7 | | 6739-9 | 6353-3 | 6467-16 | | | |
| 6460-19-20 | V tanks | | 6600-5-8 | 6479-17 | Cone | | |
| 6462-11 | 6236-10-11 | | -10 | 6489-7 | | | |
| 6467-10-16 | 6364-9 | | 6619-9 | 6492-11 | | | |
| 6479-12-14 | 6600-8 | | 6658-11-20 | 6497-7 | 6241-17 | | |
| -17 | | | -22-26-29 | 6541-3 | | | |
| 6489-7-8 | | | 6685-7-8 | 6544-10 | | | |
| 6492-8-10 | | | | 6550-16 | | | |



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## ORE DRESSING - Continued

### MILLING DETAILS - Continued

#### Tailings Disposal

| Flume or sluice | | | Belt | Pump | Wood pipe | Car |
|---|---|---|---|---|---|---|
| 6236-12 | 6476-10 | 6685-8 | 6236-5 | 6314-43 | 6394-12 | 6236-4 |
| 6241-17 | 6492-12 | 6706-15 | 6285-14 | 6447-10 | 6573-17 | |
| 6261-15 | 6532-7 | 6758-12 | 6342-7 | 6497-7 | 6574-16 | |
| 6285-14 | 6550-17 | 6759-8 | 6429-3 | 6508-8 | | |
| 6319-13 | 6555-8 | | 6532-5-7 | 6544-10 | | |
| 6358-26 | 6605-15 | | 6604-8 | 6551-8 | | |
| 6411-6 | 6619-14 | | 6624-16 | 6658-28 | | |
| 6430-8 | 6659-11 | | 6659-11 | 6706-15 | | |
| 6460-21 | 6660-12 | | 6660-10 | | | |

#### WATER SUPPLY

| Salt | Fresh | | | | | | |
|---|---|---|---|---|---|---|---|
| | Mine | River | Well | Lake | Spring | Purchased | Reclaimed |
| 6236-1 | 6261-17 | 6314-2-46 | 6241-1-21 | 6364-1-19 | 6285-1-16 | 6460-23 | 6319-14 |
| | 6280-6 | 6343-20 | 6303-3 | 6429-1 | 6343-20 | 6476-10 | 6343-20 |
| | 6319-4 | 6353-1-7 | 6314-2 | 6479-2-18 | 6555-4 | 6508-1 | 6358-2-27 -29 |
| | 6320-1 | 6358-2 | 6394-1-14 -15 | 6492-1-12 | 6758-1 | | |
| | 6359-1-11 | 6379-6 | | 6574-2 | 6759-1 | | 6359-10 |
| | 6404-2 | 6394-15 | 6532-1 | | | Trucked | 6394-12-13 |
| | 6430-2 | 6408-3 | 6573-2 | | | 6788-10 | 6411-7 |
| | 6433-1 | 6411-6 | 6590-1 | | | | 6460-20 |
| | 6467-1-19 | 6447-2 | 6604-2 | | | | 6489-9 |
| | 6489-1-9 | 6460-23 | 6706-2 | | | | 6497-2 |
| | 6508-1-10 | 6497-2 | | | | | 6544-1-10 |
| | 6550-18 | 6544-1-10 | | | | | 6555-4 |
| | 6555-4 | 6550-1-18 | | | | | 6573-2 |
| | 6590-1 | 6551-1-9 | | | | | 6604-3 |
| | 6600-13 | 6600-13 | | | | | 6658-30 |
| | 6612-12 | 6605-1-16 | | | | | 6706-2-15 |
| | 6658-30 | 6619-2 | | | | | |
| | 6742-15 | 6685-2 | | | | | |
| | | 6730-3 | | | | | |



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## ORE DRESSING - Continued

### POWER SUPPLY

| Primary | | | | | | | Secondary |
|---|---|---|---|---|---|---|---|
| Natural gas | Electric | | | | | | Electric direct |
| | Steam | Hydro | Diesel | Purchased | | | |
| 6353-1 | 6236-2 | 6236-2 | 6285-1 | 6236-2 | 6508-1 | 6824-1 | 6303-4 |
| | 6241-2 | 6314-2 | 6358-2 | 6241-2 | 6532-1 | | |
| | 6303-4 | 6364-1 | 6404-2-3 | 6280-6 | 6550-1 | | Compressed air |
| Gasoline | 6364-1 | 6408-3 | 6467-1 | 6314-1 | 6555-4 | | |
| 6788-8 | 6394-1 | 6550-1 | 6497-2 | 6320-1 | 6574-2 | | 6319-4 |
| | 6408-3 | 6551-1-9 | 6551-1-9 | 6353-1 | 6590-1 | | 6824-10 |
| | 6467-1 | 6605-17 | 6742-17 | 6359-2 | 6604-2 | | |
| | 6544-2 | 6619-2 | 6788-61 | 6411-2 | 6619-2 | | |
| | 6573-2 | 6685-2 | | 6429-2 | 6624-3 | | |
| | 6739-3 | 6742-17 | | 6430-2 | 6658-31 | | |
| | 6788-61 | | | 6433-1 | 6706-2 | | |
| | | | | 6476-10 | 6730-1 | | |
| | Waste heat | | | 6479-2 | 6739-3 | | |
| | 6343-7 | | | 6489-1 | 6758-2 | | |
| | | | | 6492-1 | 6759-2 | | |

### BENEFICIATION

#### Roasting

| | | | | | |
|---|---|---|---|---|---|
| 6280-4-5 | 6429-4-5 | 6479-16 | 6604-4-7 | 2998-4 | 3052-8 |
| 6303-13 | 6462-10 | 6532-7 | 6739-3-5 | 3045-5 | |

#### Leaching

| Percolation up | Percolation down | Electrolysis | Tanks | Launders | Distillation | Settling | Condensation |
|---|---|---|---|---|---|---|---|
| 6303-1-7 | 6364-14 | 6303-17 | 6303-7 | 6303-16 | 6364-15 | 6364-15 | 6364-16 |
| | 6408-13 | | 6364-11 | | | | |
| | | | 6815-26 | | | | |

| Reagents | Penetration | Removal | Strength | Washing | Solution clarification | Analyses |
|---|---|---|---|---|---|---|
| 6364-12 | 6425-3 | 6425-9 | 6303-9 | 6303-10-11 | 6303-13 | 6303-10-12 |
| 6425-6 | | | | | | -14-16-19 |

#### Cyanidation

##### Sand

| Solutions | Aeration | Tailing discharge | Reagents | Tanks | Classifiers | Tube mills | Chilean mills |
|---|---|---|---|---|---|---|---|
| 6408-14 | 6408-14 | 6408-15 | 6408-15 | 6408-13 | 6541-2 | 6541-2 | 6739-8 |
| 6541-3 | 6739-8 | 6739-9 | | 6739-8 | | | |



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## ORE DRESSING - Continued

## BENEFICIATION - Continued

### Cyanidation - Continued

#### Slimes

| Agitators | | Clarifier | Filters | | Solutions | Reagents | General |
|---|---|---|---|---|---|---|---|
| 6508-5 | 6739-9 | 6739-9-10 | 6408-16 | 6739-10 | 6408-17 | 6408-16 | 2998-4 |
| 6541-3 | 6824-10 | 6824-10 | 6508-6 | 6824-10 | 6508-5 | 6508-5 | |

#### Precipitation

| Zinc dust | Presses | Solutions | Reagents | Briquetting | Refining | General |
|---|---|---|---|---|---|---|
| 6408-17 | 6408-18 | 6408-18 | 6408-18-19 | 6408-19 | 6408-19 | 6661-2 |
| 6508-6 | 6508-6 | 6824-10 | 6508-7 | | 6508-7 | 6800-20-26 |
| 6541-4 | 6739-10 | | 6541-4 | | 6541-4 | |
| 6739-10 | | | 6739-10 | | 6739-10-11 | |
| 6824-10 | | | 6824-10 | | 6824-10 | |

#### Amalgamation

| Plate | Traps | Launder | Barrel | Pan | Stamps | Rod mills | Retorting |
|---|---|---|---|---|---|---|---|
| 6408-8-10 | 6408-9-10 | 6408-10 | 6236-12 | 6739-8 | 6476-4 | 6408-9 | 6236-13 |
| 6433-2-3 | 6433-3 | 6612-11 | 6433-3-4 | 6787-79 | 6800-22 | | 6408-10 |
| 6476-4-5 | 6476-4 | | 6476-5 | | | | 6429-4-9 |
| -6 | | Riffles | 6659-12 | | | | 6433-4 |
| 6800-22 | | 6659-12 | 6787-79 | | | | 6476-5 |
| | | 6660-10 | 6800-19-21 | | | | 6659-12 |
| Table | Jig | 6787-76 | -24 | Long tom | Arrastres | Reagents | 6660-11 |
| 6800-24 | 6476-5 | 6800-23 | | 6660-11 | 6661-2 | 6433-4 | 6739-8 |
| | | | | | | | 6787-81 |

## MILLING RECOVERY

#### Percent

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6236-14 | 6353-9 | 6404-26 | 6476-9 | 6544-3 | 6474-13-14 | 6619-22 | 6742-5 |
| 6241-16-19 | 6358-31 | 6408-12-19 | 6479-20-22 | 6550-18 | -27 | 6624-6 | -12-14 |
| 6261-18 | 6359-13 | 6411-7 | 6489-11 | 6551-13 | 6587-9 | 6658-32-33 | 6758-10 |
| 6280-7 | 6364-5-11 | 6429-15 | 6497-9 | 6555-9 | 6590-3 | 6685-10 | 6759-6 |
| 6303-21-23 | -19 | 6430-9 | 6508-2-9 | 6573-3-4 | 6600-7 | 6706-10-21 | 6776-37 |
| 6319-17 | 6379-1 | 6460-1-13 | -11 | -5-6-7 | 6604-11 | 6730-4 | 6792-12 |
| 6320-9-13 | 6394-14 | -25 | 6532-6-8 | -15-20 | 6605-22 | 6739-14-15 | 6824-11 |
| 6343-21-22 | 6404-6-22 | 6467-27 | 6541-4 | 6474-2-11 | 6612-12 | 6741-2 | |

### Wage - Contract - Bonus

| | | | |
|---|---|---|---|
| 6314-51 | 6488-22 | 6574-17 | 6624-20 |
| 6408-25 | 6492-17 | 6604-10 | 6658-34-35 |
| 6429-16 | 6508-10 | 6612-13 | 6742-16 |
| 6447-10 | 6551-12 | 6619-15 | 6788-12-51 |
| 6476-11 | 6555-11 | 6621-18 | 6824-11 |



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ORE DRESSING - Continued

MILLING RECOVERY - Continued

Costs - Dollars

| Labor | Power | Unit power | Supplies | Repairs | Reagents | Miscellaneous | Milling |
|---|---|---|---|---|---|---|---|
| 6236-16 | 6236-16 | 6319-19 | 6236-16 | 6261-20 | 6285-17 | 6236-15 | 6236-15 |
| 6241-23 | 6241-23 | 6320-15 | 6241-23 | 6285-17 | 6319-19 | 6241-23 | 6314-37 |
| 6261-20 | 6261-20 | 6364-6-20 | 6261-20 | 6319-19 | 6320-15 | 6261-20 | 6319-19 |
| 6280-9 | 6280-9 | 6411-2 | 6280-9 | 6320-15 | 6343-25 | 6280-9 | 6343-27 |
| 6285-17 | 6285-17 | 6476-10 | 6285-17 | 6343-25-26 | 6358-37 | 6285-17 | 6359-5 |
| 6303-7-8 | 6303-7-8 | 6497-2-13 | 6303-7-8 | -27 | 6359-15 | 6303-29 | 6364-20 |
| -9-26 | -9-26 | 6532-1 | -9-26 | 6408-21-22 | 6364-11 | 6314-52 | 6368-18 |
| 6314-52 | 6314-52 | 6551-10-13 | 6314-52 | 6411-8 | 6411-8 | 6319-19 | 6404-4-28 |
| 6319-19 | 6319-19 | 6587-10 | 6319-19 | 6479-24 | 6429-16 | 6320-15 | 6408-21 |
| 6320-15 | 6320-15 | 6604-2 | 6320-15 | 6508-13 | 6467-28 | 6357-10 | 6460-9 |
| 6343-25-26 | 6343-25-26 | 6605-23 | 6343-25-26 | 6550-22 | 6479-16-24 | 6358-37 | 6467-28 |
| -27 | -27 | 6619-23 | -27 | 6551-13 | 6497-14 | 6359-14 | 6479-8 |
| 6353-10 | 6353-10 | 6624-24 | 6353-10 | 6600-15 | 6508-13 | 6364-20 | 6489-11 |
| 6358-37 | 6358-37 | 6706-19 | 6358-37 | 6619-23 | 6541-5 | 6404-28-29 | 6532-11-12 |
| 6359-15 | 6359-15 | 6736-9 | 6359-15 | 6739-16 | 6544-3 | 6411-8 | 6544-3 |
| 6364-11-20 | 6364-11-20 | 6739-16 | 6364-20 | 6742-18 | 6550-22 | 6430-14 | 6551-13 |
| 6404-28 | 6404-28 | 6776-44-45 | 6404-28 | 6824-12 | 6587-5-6 | 6433-5 | 6573-3-4 |
| 6408-21-22 | 6408-21-22 | 6792-42 | 6408-21-22 | | -7 | 6460-35 | -5-7-19 |
| 6411-3-8 | 6411-3-8 | 6824-11 | 6411-3-8 | | 6590-6 | 6467-28 | 6587-9 |
| 6429-16 | 6429-16 | | 6429-16 | | 6600-15-16 | 6479-24 | 6590-3 |
| 6433-4-5 | 6433-5 | | 6433-5 | | 6605-23 | 6489-11 | 6600-14 |
| 6460-35 | 6460-35 | | 6460-35 | | 6619-23 | 6497-13 | 6605-3 |
| 6467-28 | 6467-28 | | 6467-28 | | 6706-19 | 6573-21 | 6624-6 |
| 6476-11 | 6476-11 | | 6476-11 | | 6736-15 | 6587-10 | 6730-4 |
| 6479-24 | 6479-24 | | 6479-24 | | 6739-16 | 6590-6 | 6735-9 |
| 6489-11-12 | 6489-11-12 | | 6489-11-12 | | 6742-18 | 6604-11 | 6736-15 |
| 6497-13-14 | 6497-13-14 | | 6497-13-14 | | 6824-11-12 | 6605-23 | 6776-50 |
| 6508-13 | 6508-13 | | 6508-13 | | | 6619-23 | 6792-12 |
| 6532-11-12 | 6532-11-12 | | 6532-11-12 | | | 6624-24 | 6800-27-30 |
| 6550-22 | 6550-22 | | 6550-22 | | | 6685-14 | 6823-7 |
| 6551-13 | 6551-13 | | 6551-13 | | | 6706-19 | 6824-12 |
| 6573-22-23 | 6573-22-23 | | 6573-22-23 | | | 6739-16 | |
| 6587-11 | 6587-11 | | 6587-11 | | | 6776-44-45 | |
| 6590-6 | 6590-6 | | 6590-6 | | | | |
| 6600-15-16 | 6600-15-16 | | 6600-15-16 | | | Mining and milling | Loading box cars |
| 6604-11 | 6604-11 | | 6604-11 | | | 6236-16 | |
| 6605-23 | 6605-23 | | 6605-23 | | | 6612-13 | |
| 6612-13 | 6612-13 | | 6612-13 | | | 6788-34-36 | 6605-14 |
| 6619-23 | 6619-23 | | 6619-23 | | | -40 | |
| 6685-15 | 6685-15 | | 6685-15 | | | | Steamer |
| 6706-19 | 6706-19 | | 6706-19 | | | | 6619-14 |
| 6736-15 | 6736-15 | | 6736-15 | | | | |
| 6739-16 | 6739-16 | | 6739-16 | | | | |
| 6742-18 | 6742-18 | | 6742-18 | | | Smelting | |
| 6824-12 | 6824-12 | | | | | 6800-30 | |



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## ORE DRESSING - Continued

## MILLING RECOVERY - Continued

### Costs - Dollars - Continued

| Primary crushing | Secondary crushing | Grinding | Screening | Conveying | De-watering | Water supply | Tailing disposal |
|---|---|---|---|---|---|---|---|
| 6236-15 | 6236-15 | 6236-15 | 6236-15 | 6261-20 | 6241-23 | 6241-23 | 6236-15 |
| 6241-23 | 6241-4-23 | 6241-23 | 6261-20 | 6280-9 | 6261-20 | 6261-20 | 6241-23 |
| 6261-20 | 6261-20 | 6261-20 | 6280-9 | 6285-17 | 6280-9 | 6280-6 | 6261-20 |
| 6280-9 | 6285-17 | 6285-17 | 6314-52 | 6303-26 | 6285-17 | 6285-17 | 6285-17 |
| 6285-17 | 6319-19 | 6314-52 | 6319-19 | 6314-52 | 6319-19 | 6303-27 | 6303-27 |
| 6303-26-29 | 6343-25 | 6319-19 | 6429-16 | 6319-13-19 | 6320-15 | 6319-19 | 6319-19 |
| 6314-52 | 6379-2-3 | 6320-15 | 6433-5 | 6343-26 | 6343-25 | 6320-15 | 6320-15 |
| 6319-19 | 6404-28-29 | 6343-25 | 6462-12-14 | 6357-10 | 6364-11 | 6343-26 | 6343-26 |
| 6320-15 | 6408-21 | 6353-10 | 6497-4-13 | 6358-37 | 6379-9 | 6353-10 | 6358-37 |
| 6343-25 | 6433-5 | 6357-10 | 6541-5 | 6364-11 | 6460-35 | 6358-37 | 6364-20 |
| 6353-10 | 6460-35 | 6358-37 | 6544-5-11 | 6404-28-29 | 6479-24 | 6364-20 | 6404-28-29 |
| 6358-37 | 6467-28 | 6359-14 | 6550-22 | 6433-5 | 6489-11-12 | 6379-6 | 6411-8 |
| 6359-14 | 6479-24 | 6364-6-20 | 6600-15 | 6467-28 | 6544-11 | 6404-21-28 | 6460-35 |
| 6379-2 | 6489-3-4 | 6379-4 | 6604-11 | 6541-5 | 6550-22 | -29 | 6467-18-28 |
| 6404-28-29 | -11 | 6404-28-29 | 6624-24 | 6544-11 | 6573-21 | 6411-7-8 | 6479-24 |
| 6408-21 | 6497-4-13 | 6408-21 | 6685-14 | 6550-22 | 6587-11 | 6460-35 | 6489-11-12 |
| 6411-3-8 | 6508-13 | 6411-8 | 6739-16 | 6573-21 | 6604-11 | 6467-28 | 6497-13 |
| 6429-16 | 6541-5 | 6430-14 | 6776-44-45 | 6587-10 | 6619-23 | 6476-10 | 6544-11 |
| 6430-14 | 6550-22 | 6433-5 | 6800-24 | 6600-4-15 | 6706-19 | 6479-24 | 6550-22 |
| 6433-5 | 6600-16 | 6460-35 | | -16 | 6776-44-45 | 6497-2-13 | 6573-21 |
| 6460-35 | 6604-11 | 6467-28 | | 6604-11 | | 6532-11-12 | 6605-16-23 |
| 6467-28 | 6619-23 | 6479-22-24 | Classifying | 6619-14-16 | Thickening | 6550-22 | 6706-19 |
| 6479-24 | 6624-24 | 6489-11-12 | 6261-20 | 6624-24 | 6343-25 | 6573-21 | 6730-3 |
| 6489-3-4 | 6685-14 | 6497-13 | 6285-17 | 6685-14 | 6359-14 | 6587-10 | 6736-15 |
| -11-12 | 6736-15 | 6508-13 | 6319-19 | 6739-16 | 6408-23 | 6590-6 | 6739-16 |
| 6497-13 | 6739-4-16 | 6541-5 | 6320-15 | 6776-44-45 | 6489-12 | 6605-16-23 | 6776-44-45 |
| 6508-13 | 6742-18 | 6544-5 | 6408-23 | | 6541-5 | 6706-19 | |
| 6541-5 | 6776-44-45 | 6550-22 | 6430-14 | | 6587-10 | 6739-16 | Tailing dam |
| 6544-11 | | 6573-21 | 6433-5 | Elevating | 6605-23 | 6776-44-45 | 6605-15 |
| 6550-22 | | 6587-10-11 | 6541-5 | 6353-10 | 6736-15 | 6824-11 | Heating |
| 6551-13 | | 6590-6 | 6544-5-11 | 6479-20 | Filtering | Pumping | 6590-6 |
| 6573-21 | | 6600-15-16 | 6550-22 | 6544-11 | 6343-26 | 6357-10 | 6605-23 |
| 6587-10 | | 6605-23 | 6587-10 | 6587-10 | 6359-14 | 6379-6 | |
| 6590-6 | | 6619-23 | 6739-16 | 6600-15 | 6430-14 | 6489-12 | Sorting |
| 6600-4 | | 6685-14 | 6742-18 | 6624-24 | 6489-11-12 | 6497-2-6 | 6236-15 |
| 6604-11 | | 6706-19 | 6776-44-45 | 6739-16 | 6497-13 | -7 | 6359-14 |
| 6619-23 | | 6736-15 | 6800-24 | 6776-44-45 | 6544-11 | 6541-5 | 6429-16 |
| 6624-24 | | 6742-18 | | | 6587-10 | 6587-10 | 6430-14 |
| 6736-15 | | 6757-1 | | | 6590-6 | 6604-11 | 6462-12-14 |
| 6739-16 | | 6776-44-45 | | | 6605-23 | 6742-18 | 6544-11 |
| 6742-18 | | 6800-24 | | Launders | 6736-15 | 6776-44-45 | 6600-4 |
| 6776-44-45 | | 6824-12 | | 6587-10 | 6739-16 | | 6776-45 |
| 6800-24 | | | | | 6742-18 | | |
| 6824-12 | | | | | | | |



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## ORE DRESSING - Continued

## MILLING RECOVERY - Continued

### Costs - Dollars - Continued

| Assaying & sampling | Flotation | Cyaniding | Amalgamation | Leaching | Stamping | Tube mills | Jigging |
|---|---|---|---|---|---|---|---|
| 6241-23 | 6241-4-23 | 6408-21-23 | 6408-12-22 | 6303-27-29 | 6364-20 | 6236-15 | 6314-37 |
| 6261-20 | 6261-4-20 | -24 | 6739-16 | 6357-10 | 6408-22 | 6408-22 | -52 |
| 6285-17 | 6285-17 | 6508-13 | | 6364-16-17 | | 6508-13 | 6353-10 |
| 6319-19 | 6314-37-52 | 6541-5 | | -20 | | 6541-5 | 6379-5 |
| 6320-15 | 6319-19 | 6739-16 | Retorting | 6739-16 | Conc crusher | Ball mills | 6600-15 |
| 6343-26 | 6320-9-15 | 6824-12 | | | | | 6685-14 |
| 6353-10 | 6343-25 | | 6408-12 | Magnetic separation | 6544-11 | 6236-15 | 6776-44 |
| 6358-37 | 6357-10 | | 6429-16 | | 6706-19 | 6343-25 | -45 |
| 6359-14 | 6358-37 | Precipitating | | 6280-9 | 6739-16 | 6364-6 | |
| 6404-28-29 | 6359-14 | | | 6604-11 | | 6404-28-29 | Tabling |
| 6408-22-23 | 6364-11-20 | 6408-23 | Distillation | 6624-24 | Comminuter | 6408-21 | 6280-9 |
| 6429-16 | 6379-7 | 6541-5 | | | | 6411-8 | 6314-37 |
| 6460-35 | 6404-6-28 | 6739-16 | 6364-17 | | 6739-16 | 6460-35 | -52 |
| 6467-28 | -29 | | | Roasting | | 6508-13 | 6353-10 |
| 6479-24 | 6411-8 | | | 6429-16 | | 6544-11 | 6357-10 |
| 6489-12 | 6429-16 | Refining | Steam | 6604-11 | Rolls | 6587-11 | 6460-9 |
| 6508-13 | 6430-14 | 6408-22-23 | 6364-20 | 6739-16 | 6236-15 | 6600-15-16 | -35 |
| 6550-22 | 6460-35 | 6508-13 | | | 6497-4 | | 6604-11 |
| 6551-13 | 6467-24-28 | 6541-5 | | | 6544-11 | | 6605-23 |
| 6573-22 | 6479-24 | 6739-16 | Condensing | Drying | 6600-15 | Balls | 6685-14 |
| 6590-6 | 6489-13 | 6824-12 | 6429-16 | 6379-9 | 6739-16 | 6497-5-14 | 6776-44 |
| 6605-23 | 6497-13 | | | 6364-6 | | 6544-5 | -45 |
| 6619-23 | 6544-1-11 | | | 6624-24 | | 6590-6 | Trommel |
| 6685-14 | 6550-22 | Agitating | | | Rod mills | 6600-16 | 6236-15 |
| 6706-19 | 6573-21 | 6541-5 | | | 6404-28-29 | 6605-5 | 6497-4 |
| 6736-15 | 6587-10 | | | | 6408-21-22 | 6619-17 | 6544-5 |
| 6739-16 | 6590-6 | Clarification | | | 6467-28 | 6742-11 | 6600-15 |
| 6776-44-45 | 6600-15-16 | | | | 6706-19 | 6824-12 | Vibrator |
| 6824-12 | 6605-23 | 6541-5 | | | | | 6236-15 |
| | 6619-23 | 6739-16 | | | | | 6497-4 |
| | 6736-15 | | | | Pebble mills | Chilean mills | 6739-16 |
| | 6742-18 | | | | 6364-20 | 6739-16 | |
| | 6776-44-45 | | | | | | |

| Plant | | Royalty | Research | Taxes | Pebbles |
|---|---|---|---|---|---|
| 6591-15-16 | 6730-3-4 | 6364-11 | 6241-23 | 6303-29 | 6357-10 |
| -17 | 6735-8 | 6460-35 | 6479-24 | | 6364-6 |
| 6685-1 | 6800-23-26 | 6573-23 | 6573-23 | | |
| 6693-21 | -27 | 6605-23 | 6605-23 | | |
| 6707-24-25 | 6824-6 | 6619-23 | 6742-18 | | |
| -26-27 | | 6736-15 | | | |
| | | 6800-30 | | | |



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# ORE DRESSING - Continued

## MILLING RECOVERY - Continued

### Costs - Material Units

**Crusher plates**
6280-3
6319-5
6411-3
6430-4
6476-3
6489-3-4
6492-4
6497-4-14
6508-3
6574-6
6619-7
6624-7
6742-7
6758-4

**Balls**
6241-25
6261-4-7
6285-7-8
-17
6314-30
6319-6-18
6320-6-14
-16
6342-4
6343-14-24
-28
6353-6
6357-10
6359-4
6394-7
6404-26
6411-4-7
6430-5-13
6433-2-5
6460-11-12
-27
6467-10-11
-27-29
6479-12
6489-11
6492-7
6497-5-10
6508-4-11
6541-3-5
6544-5
6550-8-9
-18
6551-5-13
-14
6555-6-10
6573-21
6587-3-10
-11
6605-5
6619-8-17
-22
6736-13
6739-14
6742-9-11
-14
6758-5
6824-9

**Pebbles**
6357-10
6364-6
6408-9

**Rods**
6358-15-36
6394-6
6404-9
6408-8-20
6447-4-14
6467-29
6492-7
6574-7-8
-27
6658-13
6706-11-19
-21

**Rubber lining**
6408-9

**Pump liners**
6574-17

**Kiln lining**
6429-5

**Mill liners**
6261-7
6285-7-8
-17
6314-31
6319-7-10
6320-6-14
-16
6342-4
6343-14-24
-28
6353-6
6358-16-36
6359-4
6364-6
6394-6-7
6404-9-11
-26
6408-8-9
-20
6430-5-13
6433-2-5
6447-4-14
6460-11-12
-27
6467-10-11
-27-29
6479-12
6492-7
6508-4-11
6544-5
6550-8-9
6551-5-13
-14-18
6555-6-10
6573-21
6587-3-10
-11
6605-4
6619-9-17
-22
6658-12
6706-11
6739-14
6742-9-11
-14
6758-5

**Water**
6280-8
6285-16-17
6303-11-25
6314-6-46
6319-4
6320-14
6343-24
6353-9
6353-2-36
6359-11
6364-7-19
6394-15
6404-21
6411-7
6429-7
6447-2-14
6460-20-24
-26
6467-27
6476-9-10
6479-21
6489-9-11
6492-12
6497-2
6508-10-11
6532-10
6544-10
6550-18
6551-9-13
6555-10
6573-20
6574-17-27
6605-16
6612-12
6658-30-33
6739-14
6742-14
6758-13
6792-41
6788-50-60

**Compressed air**
6544-8

**Reagents**
6241-25
6285-4-11
6314-39
6319-11-18
6320-7-8
-16
6343-16-28
6353-10
6358-20-38
6359-6
6364-10-17
6394-9
6404-13-26
6408-20
6411-5-7
6429-9-17
6430-6-7
-14
6433-4
6447-5-6
-15
6460-18-26
6467-13-29
6479-16
6489-6
6497-6-10
6508-11
6541-5
6544-8
6550-14-18
6551-13-14
6555-10
6573-20-21
6574-11-12
-14-28
6587-5-6
-7
6590-4
6600-9
6605-6-11
6619-11-22
6658-19-36
6685-12
6706-7-12
-13-20
6739-14
6742-5-14
-18

**Zinc**
6758-8-11
6759-4
6776-38
6824-11

**Cyanide solution**
6408-20
6508-11
6541-3-5
6824-11

**Sulphuric acid**
6303-4-9
-15-23

**Pyrite**
6303-4-13

**Scrap iron**
6303-4-15

**Oxygen**
6408-12

**Quick-silver**
6408-10
6433-5
6476-6-9

**Fuel coal**
6479-16
6551-7
6574-15
6624-10
6739-5

**Oil**
6276-8
6280-4-5
6429-6-17

**Wood**
6788-61

**Filter cloth**
6447-9
6460-19
6467-16
6492-11
6497-7-14
6541-4-5
6550-16
6555-8
6587-7
6658-27
6742-13
6758-12

**Screens**
6492-5
6497-4-14
6541-2-5
6550-6
6574-6
6658-21

**Conveyor belts**
6550-19

**Flotation blankets**
6555-7



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ORE DRESSING - Continued

MILLING RECOVERY - Continued

Costs - Labor Units

| Crushing | Grinding | Screening | Conveying | Dewatering | Concentrating gravity | Flotation | Assaying and sampling |
|---|---|---|---|---|---|---|---|
| 6261-21 | 6261-21 | 6261-21 | 6343-28 | 6261-21 | 6353-10 | 6261-21 | 6285-18 |
| 6280-10 | 6285-18 | 6285-18 | 6353-10 | 6280-10 | 6404-27 | 6285-18 | 6320-16 |
| 6285-18 | 6320-16 | 6353-10 | 6467-29 | 6285-18 | 6476-12 | 6320-16 | 6343-28 |
| 6319-20 | 6343-28 | 6429-17 | 6532-11 | 6320-16 | 6776-41-42 | 6343-28 | 6429-17 |
| 6320-16 | 6353-10 | 6532-11 | 6550-22 | 6353-10 | | 6353-10 | 6447-15 |
| 6353-10 | 6430-14 | 6550-22 | 6573-24 | 6532-11-12 | | 6429-17 | 6467-29 |
| 6430-14 | 6447-15 | 6573-24 | 6574-28 | 6550-22 | | 6430-14 | 6550-22 |
| 6433-4 | 6467-29 | 6574-28 | 6604-11 | 6551-14 | Jigs | 6447-15 | 6551-14 |
| 6447-15 | 6550-22 | 6604-11 | 6685-15 | 6587-11 | 6532-11-12 | 6467-24-29 | 6573-24 |
| 6467-29 | 6551-14 | 6685-15 | 6739-17 | 6604-12 | 6685-15 | 6550-22 | 6658-36 |
| 6532-12 | 6573-24 | 6739-17 | 6776-41-42 | 6619-24 | | 6551-14 | 6685-15 |
| 6550-5-6 | 6574-28 | 6776-41-42 | | 6776-41-42 | Tables | 6573-24-28 | 6706-20 |
| -22 | 6587-11 | | | -43 | 6280-10 | | 6739-17 |
| 6551-14 | 6619-24 | | | 6792-43 | 6532-11-12 | 6587-11 | 6776-41-42 |
| 6573-24 | 6658-36 | | | | 6604-12 | 6619-24 | -43 |
| 6574-28 | 6685-15 | Sorting | Classifying | Filtering | 6658-36 | 6658-36 | 6792-43 |
| 6587-11 | 6706-20 | | | | 6685-15 | 6706-20 | |
| 6604-12 | 6739-17 | 6236-16 | 6353-10 | 6343-28 | | 6776-41-42 | |
| 6619-24 | 6776-41-42 | 6430-14 | 6430-14 | 6430-14 | | 6792-43 | |
| 6658-36 | 6792-43 | 6447-15 | 6550-22 | 6447-15 | Magnetic | | |
| 6685-15 | | 6462-13 | 6551-14 | 6658-36 | 6280-10 | | |
| 6706-20 | | 6532-12 | 6574-28 | 6706-20 | 6532-11-12 | | |
| 6739-17 | | 6776-41-42 | 6706-20 | 6739-17 | 6604-12 | | |
| 6776-41-42 | | | 6739-17 | Thickening | | | |
| 6792-43 | | | 6776-41-42 | 6343-28 | | | |
| | | | 6792-43 | 6573-24 | | | |

| Tailing disposal | Water supply | Milling | Roasting | Cyaniding | Amalgamation | Stamping | Trucking |
|---|---|---|---|---|---|---|---|
| 6261-21 | 6261-21 | 6236-16 | 6276-8 | 6408-20 | 6433-4 | 6408-20 | 6532-11 |
| 6285-18 | 6285-18 | 6241-25 | 6429-17 | 6739-17 | 6476-12 | 6476-12 | 6462-13 |
| 6320-16 | 6343-28 | 6261-21 | 6604-12 | | 6739-17 | | |
| 6343-28 | 6467-29 | 6358-37 | 6739-17 | | | | |
| 6353-10 | 6532-11-12 | 6430-14 | | | | | |
| 6467-29 | 6550-22 | 6460-26-36 | | | | | |
| 6550-22 | 6573-24 | 6497-14 | Lining kiln | Retorting | Condensing | Rod mill | Aerial tram |
| 6551-14 | 6792-43 | 6532-11-12 | 6429-6 | 6429-17 | 6429-17 | 6408-20 | 6555-8 |
| 6573-24 | | 6574-18 | | | | | 6604-12 |
| 6574-28 | | 6776-41-42 | | | | | |
| 6739-17 | | -43 | | | | | |
| 6776-41-42 | | 6788-51 | | | | | |
| -43 | | 6792-42 | | | | | |
| 6792-43 | | | | | | | |



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## ORE DRESSING - Continued

## MILLING RECOVERY - Continued

### Costs - Power Units

### Crushing

| Jaw | | | Gyratory | | Cone | Rolls | |
|---|---|---|---|---|---|---|---|
| 6236-4-6 | 6497-12-14 | 6739-18 | 6241-24 | 6544-4-11 | 6314-9 | 6236-6 | 6550-6 |
| 6280-10 | 6508-3 | 6742-7-17 | 6261-4 | 6550-5-22 | 6319-6 | 6320-4 | 6555-6 |
| 6285-6 | 6532-12 | 6776-40 | 6314-8-10 | 6574-6 | 6394-16 | 6342-5 | -11 |
| 6314-6-13 | 6550-5-22 | 6792-39 | 6320-4-16 | 6624-3 | 6411-2 | 6379-3-5 | 6573-9 |
| 6319-5-20 | 6551-14 | 6804-35 | 6358-12-38 | 6658-9-36 | 6430-5 | 6394-16 | 6574-6 |
| 6342-5-13 | 6555-6-11 | 6824-9-11 | 6379-2 | 6736-15 | 6447-3 | 6433-2 | -28 |
| 6353-10 | 6574-5-28 | | 6404-7-27 | 6742-7-17 | 6460-26 | 6460-8 | 6619-7 |
| 6404-7-27 | 6587-11 | | 6408-5-6 | 6792-39 | 6479-10-25 | 6467-6-9 | -24 |
| 6408-5 | 6604-12 | | 6467-5-7 | | 6489-3 | -11-29 | 6658-9 |
| 6411-2 | 6619-24 | Disk | -29 | Stamps | 6544-4 | 6479-10-25 | -36 |
| 6430-4-14 | 6624-3 | 6404-27 | 6479-9-25 | | 6573-8-25 | 6492-5 | 6685-15 |
| 6447-3-15 | 6685-15 | 6467-5-7 | 6492-4-16 | 6364-5 | 6619-7-24 | 6497-12 | 6736-15 |
| 6460-26 | 6735-6 | -8-29 | 6508-3 | 6408-6-20 | 6706-11-20 | 6541-2 | 6739-18 |
| 6476-3 | 6736-15 | 6658-9 | 6541-1 | 6476-12 | | 6544-4 | 6758-4 |

### Grinding

| Ball mills | | | | | Rod mills | | Pebble mills |
|---|---|---|---|---|---|---|---|
| 6236-8 | 6353-10 | 6433-2 | 6551-14 | 6742-9-17 | 6261-7 | 6706-11-20 | 6364-6 |
| 6241-24 | 6357-9 | 6460-11-26 | 6555-6-11 | 6757-8 | 6379-4 | 6757-8 | 6379-4 |
| 6285-7 | 6358-38 | 6467-10-11 | 6573-9-25 | 6758-5 | 6394-6-16 | | 6467-10 |
| 6314-16-17 | 6359-4 | -14 | 6587-11 | 6776-40 | 6404-8-27 | | 6757-8 |
| -18-19 | 6364-6 | 6479-13-25 | 6600-11 | 6792-39 | 6408-8-20 | | Chilean mills |
| -20-21 | 6379-4 | 6492-7-16 | 6605-4-23 | 6824-9-11 | 6447-4-15 | Tube mills | |
| 6319-6-20 | 6394-7-16 | 6497-12-14 | 6619-8-24 | | 6467-12 | 6508-4 | 6739-18 |
| 6320-5-16 | 6404-8-27 | 6508-4 | 6685-15 | | 6492-7-16 | 6541-3 | |
| 6342-4-13 | 6411-3 | 6544-5 | 6735-6 | | 6574-7-28 | 6550-9 | |
| 6343-14-28 | 6430-5-14 | 6550-7-22 | 6736-15 | | 6658-13 | | |

### Sizing

| Classifiers | | | | Screens | | | |
|---|---|---|---|---|---|---|---|
| 6314-16-17 | 6404-8-27 | 6555-6 | 6742-17 | 6280-10 | 6532-11-12 | 6776-40 | |
| -18-21 | 6430-5 | 6573-9-11 | 6776-40 | 6319-7-20 | 6550-6-22 | | Vibrator |
| 6319-7-20 | 6433-2 | 6574-7-28 | 6792-39 | 6342-5 | 6555-6 | Trommels | 6497-12 |
| 6320-16 | 6467-12-17 | 6605-5 | | 6379-3 | 6574-6-28 | | 6550-6 |
| 6342-5 | 6479-13 | 6658-22 | Sand | 6429-3-17 | 6604-12 | 6497-12 | 6574-6 |
| 6358-38 | 6497-12 | 6706-11 | wheel | 6467-7-11 | 6624-15 | 6555-6 | |
| 6379-4 | 6550-9-22 | 6735-6 | 6364-18 | 6479-10 | 6685-15 | 6612-11 | Grizzly |
| 6394-16 | 6551-14 | 6739-18 | | 6497-12 | 6739-18 | 6685-15 | 6573-8 |



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ORE DRESSING - Continued

MILLING RECOVERY - Continued

Costs - Power Units - Continued

Conveying

| Conveyor | | Elevator | | Pump | | Feeder | Aerial tram |
|---|---|---|---|---|---|---|---|
| 6280-10 | 6532-11-12 | 6280-10 | 6544-9 | 6319-14 | 6573-18 | 6319-5-7 | 6285-5 |
| 6319-13-20 | 6550-19-22 | 6314-19-20 | 6550-16-19 | 6320-16 | 6574-10-11 | 6343-12 | 6379-3 |
| 6320-16 | 6555-4 | -23-24 | 6551-14 | 6342-13 | -12-13-17 | 6379-3 | 6416-14 |
| 6342-13 | 6573-25 | 6319-7 | 6555-6 | 6353-10 | 6604-12 | 6404-7 | 6544-9 |
| 6343-28 | 6574-6-7 | 6342-5-13 | 6574-6-8 | 6357-8 | 6605-13 | 6429-3 | 6555-8 |
| 6358-23-38 | -16-28 | 6353-10 | 6624-3 | 6379-4-16 | 6612-12 | 6447-3 | 6604-12 |
| 6379-3-4 | 6604-12 | 6358-23 | 6658-24 | 6467-14-17 | 6658-31 | 6467-12-29 | 6806-14 |
| -5-8 | 6624-3 | 6379-2-3 | 6739-18 | -29 | 6706-15-20 | 6479-10 | |
| 6394-16 | 6658-23 | -5-8 | 6776-40 | 6479-15 | 6742-17 | 6492-4 | Car loader |
| 6404-7-8 | 6685-15 | 6394-16 | | 6492-16 | 6758-13 | 6574-5 | 6574-16 |
| -27 | 6739-7-18 | 6467-7-9 | | 6497-2-12 | 6776-40-41 | 6605-4 | |
| 6467-5-6 | 6758-4 | -11-20-30 | | 6532-11 | 6788-11 | 6735-6 | |
| -7-8-9 | 6776-40 | 6479-10-13 | Hoisting | 6544-9 | 6824-11 | 6824-11 | Car dumper |
| -20-29-30 | 6824-11 | 6492-4 | | 6550-13 | | | 6479-9 |
| 6479-9-10 | | 6497-12 | 6532-12 | 6555-7 | | | |

Dewatering

| Dewatering | | Filter | | Vacuum pump | Thickener | Drier |
|---|---|---|---|---|---|---|
| 6280-10 | 6551-14 | 6241-24 | 6605-13-23 | 6343-18 | 6343-28 | 6429-5-17 |
| 6319-20 | 6573-25 | 6343-28 | 6658-26 | 6394-16 | 6404-8 | 6574-15 |
| 6320-16 | 6587-11 | 6430-8-14 | 6706-20 | 6404-8 | 6479-15 | 6604-12 |
| 6342-13 | 6604-12 | 6447-9-15 | 6735-6 | 6447-9 | 6497-12 | |
| 6343-28 | 6619-24 | 6394-16 | 6736-15 | 6479-17 | 6550-16-17 | Kiln firing |
| 6379-5-6 | 6776-40-41 | 6404-8-16 | 6739-18 | 6541-4 | 6605-23 | 6429-6-17 |
| 6467-16 | 6792-40 | 6492-16 | 6742-17 | 6555-8 | 6658-20 | |
| 6479-25 | | 6497-12-14 | | 6574-14 | 6706-20 | |
| 6532-11-12 | | 6550-16 | | 6605-17 | 6736-15 | |
| 6550-22 | | 6555-11 | | 6658-26 | 6824-9 | |



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## ORE DRESSING - Continued

## MILLING RECOVERY - Continued

### Costs - Power Units - Continued

#### Concentrating

| Flotation | | | | Table | Jig | Mag-netic | Amalga-mation |
|---|---|---|---|---|---|---|---|
| 6241-15-24 | 6429-17 | 6574-9-28 | | 6280-10 | 6342-13 | 6280-10 | 6739-18 |
| 6261-4 | 6430-6-7 | 6587-5-11 | Blower | 6319-8-20 | 6353-10 | 6532-5-11 | |
| 6314-21-23 | -14 | 6600-9 | 6555-7 | 6353-10 | 6379-5 | -12 | Retort |
| -24-26 | 6447-4-15 | 6605-7-8 | 6574-9 | 6460-9 | 6532-11-12 | 6604-12 | 6429-17 |
| -27-29 | 6460-26 | -9-23 | 6605-16 | 6476-12 | 6685-15 | 6624-3 | |
| 6319-20 | 6467-14-24 | 6619-10-24 | 6619-10 | 6492-16 | 6776-40 | | |
| 6320-16 | -29 | 6658-19-36 | 6758-9 | 6532-12 | | | |
| 6342-13 | 6479-15-25 | 6706-12-20 | | 6604-12 | Leaching | Roasting | Cyanide |
| 6343-16-28 | 6492-9-16 | 6735-6 | | 6605-23 | 6303-25 | 6739-5-18 | 6408-20 |
| 6353-10 | 6497-12-14 | 6736-15 | Agitator | 6658-16-36 | 6739-18 | | 6739-18 |
| 6358-17-38 | 6550-13-22 | 6742-17 | 6605-8 | 6685-15 | | Elec-trolysis | 6824-11 |
| 6379-7 | 6551-14 | 6758-7 | | 6776-40 | | 6303-18 | |
| 6394-16 | 6555-11 | 6776-40-41 | | | | | |
| 6404-8-27 | 6573-25 | 6792-40 | | | | | |

#### Miscellaneous

| Water supply | | | Tailing disposal | | Sampling | General |
|---|---|---|---|---|---|---|
| 6241-24 | 6476-12 | 6735-6 | 6320-16 | 6574-28 | 6320-16 | 6241-24 |
| 6280-6 | 6479-25 | 6776-40-41 | 6342-13 | 6658-36 | 6343-28 | 6320-16 |
| 6319-20 | 6494-12-16 | 6783-11 | 6343-28 | 6736-15 | 6358-38 | 6429-17 |
| 6343-28 | 6497-12-14 | 6792-40 | 6358-38 | 6739-18 | 6404-27 | 6433-5 |
| 6358-31-38 | 6532-11-12 | | 6447-10 | 6776-40-41 | 6429-17 | 6447-15 |
| 6379-6 | 6544-10 | | 6467-29 | 6792-40 | 6550-22 | 6476-10 |
| 6394-15-16 | 6550-22 | | 6497-12-14 | | 6605-23 | 6736-15 |
| 6404-27 | 6551-14 | | 6550-22 | | | 6776-40-41 |
| 6429-1 | 6605-23 | | 6551-14 | | | |
| 6460-23 | 6658-36 | | 6573-25 | | | |



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## NONMETAL MINING

### MODE OF OCCURRENCE

| Surface | | | Underground | | |
|---|---|---|---|---|---|
| Massive | Bedded | Unconsolidated | Massive | Bedded | Vein |
| 6405-2 | 6356-2 | 6420-2 | 6488 | 6119 | 6294 |
| 6599-2 | 6448-2 | 6421-1-3 | 6616 | 6151 | 6384 |
| 6609-4 | 6498-2 | 6537-2 | | 6152 | |
| 6610-4 | 6513-2 | 6580-3 | | 6156 | |
| 6744-2 | 6522-2 | 6581-2 | | 6277 | |
| | 6531-2 | 6582-3 | | 6378 | |
| | 6554-2 | 6592-4 | | 6446 | |
| | 6599-2 | 6626-1 | | 6598 | |
| | 6603-2 | 6652-2 | | 6602 | |
| | 6608-2 | 6657-2 | | 6615 | |
| | 6610-2 | 6676-2 | | 6640 | |
| | | 6692-2 | | 6679 | |
| | | 6696-2 | | 6795 | |
| | | 6607-2 | | | |
| | | 6668-4 | | | |
| | | 6689 | | | |
| | | 6705-2 | | | |
| | | 6814 | | | |
| | | 6826 | | | |



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## NONMETAL MINING - Continued

### PROSPECTING

| Geology | Sampling and estimating tonnage | Physical characteristics, chemical analyses | Surface testing | | | | Underground testing |
|---|---|---|---|---|---|---|---|
| | | | Vegetation | Drilling | | | |
| | | | | Churn drill | Core drill | Auger | Shafts |
| 6356-3 | 6294-3 | 6356-3 | 6652-4 | 6384-3 | 6294-3 | 6498-3 | 6384-3 |
| 6405-2-3 | 6356-4 | 6420-2 | 6668-16 | 6421-5 | 6356-3-4 | 6537-3 | 6616-10 |
| 6448-2 | 6384-4 | 6446-2-3 | | 6446-4 | 6384-3 | 6581-3 | 6668-24 |
| 6420-2 | 6405-3 | 6448-2 | Outcrop | 6448-3 | 6522-2 | 6652-4 | |
| 6421-3 | 6421-6 | 6498-3 | 6554-2 | 6498-3 | 6531-2 | 6657-2 | |
| 6446-2 | 6446-4 | 6513-3-4 | 6609-6 | 6513-4 | 6603-3 | 6668-22 | |
| 6498-2 | 6448-3-4-7 | 6522-3 | 6668-13 | 6522-2 | 6610-3 | | Drifts and cross-cuts |
| 6513-2 | 6498-3 | 6531-2 | | 6537-3 | 6795-3 | | 6294-3 |
| 6522-2 | 6513-5 | 6537-2 | Dredge | 6580-4 | | | 6384-3 |
| 6531-2 | 6522-2-3 | 6554-3 | 6582-3 | 6603-3 | | | 6610-3 |
| 6537-2 | 6531-3 | 6592-5 | 6626-2 | 6668-22 | | | Hammer drill |
| 6554-2 | 6581-3 | 6599-2-3 | 6668-43 | 6696-2 | Pipe | | 6615-4 |
| 6580-3 | 6582-4 | 6603-2-4 | | | 6420-3 | | 6795-3 |
| 6581-2 | 6592-5 | 6607-3 | Test pits | | 6537-3 | | |
| 6582-3 | 6599-3 | 6609-6 | 6356-2-3-4 | | 6581-3 | | |
| 6592-4 | 6603-3 | 6610-3 | 6420-3 | Sounding bar | 6668-20-23 | | |
| 6599-2 | 6607-3 | 6615-4 | 6537-3 | 6421-5 | Orangepeel bucket | | |
| 6603-2 | 6608-2 | 6616-5 | 6554-2 | 6668-20 | 6420-3 | | |
| 6608-2 | 6610-4 | 6652-3 | 6580-3 | | 6652-4 | | |
| 6609-4 | 6626-2-3 | 6689-5 | 6581-3 | | 6668-23 | | |
| 6610-2 | 6652-4 | 6692-3 | 6592-5 | | | | |
| 6616-3 | 6657-3 | 6744-3 | 6603-3 | | Steel shapes | | |
| 6626-1 | 6668-25-32 | | 6607-3 | | 6668-22 | | |
| 6652-2 | 6795-3 | | 6610-3 | | | | |
| 6668-4 | | Crushing strength | 6615-4 | | | | |
| 6676-2 | | 6405-2 | 6652-4 | | | | |
| 6692-2 | | 6531-2 | 6668-23-24 | | | | |
| 6705-2 | | 6599-3 | 6676-3 | | | | |
| 6744-2 | | 6603-2 | 6692-3 | | | | |
| | | 6607-3 | | | | | |
| | | 6609-5 | | | | | |
| Geophysical | | 6744-2 | | | | | |
| 6668-16 | | 6689-5 | | | | | |



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NONMETAL MINING - Continued

DEVELOPMENT

Surface

Type of Deposit

| | Bank | Pit | | Subaqueous | | |
|---|---|---|---|---|---|---|
| | | Dry | Wet | River | Lake | Ocean |
| | 6462-5 | 6356-4 | 6420-1 | 6421-1 | 6689-13-42 | 6592-5 |
| | 6405-1 | 6448-4 | 6537-2 | 6582-4 | 6798-2 | 6689-13-42 |
| | 6498-4 | 6522-3 | 6580-1 | 6626-2 | 6826 | 6798-2 |
| | 6513-5 | 6531-3 | 6581-4 | 6689-13-41 | | 6826 |
| | 6554-2 | 6554-2 | 6652-5 | 6696-2 | | |
| | 6599-3 | 6607-3 | 6676-3 | 6798-2 | | |
| | 6603-3 | 6608-2 | 6689-13-38 | 6826 | | |
| | 6609-6 | 6657-3 | 6705-4 | | | |
| | 6610-4 | 6676-3 | 6798-2 | | | |
| | 6615-4 | 6689-13-35 | 6814-45-63 | | | |
| | 6689-13-15 | 6692-4 | | | | |
| | 6798-2 | 6744-3 | | | | |
| | 6814-45-75 | 6798-2 | | | | |
| | | 6814-45-63 -75 | | | | |
| Stripping | 6462-5 | 6356-2-5 | 6537-5 | | | |
| | 6405-3 | 6448-5 | 6581-4 | | | |
| | 6498-3 | 6522-3 | 6652-5 | | | |
| | 6513-5 | 6531-3 | 6689-4-15 | | | |
| | 6554-3 | 6554-3 | 6705-3 | | | |
| | 6603-3-5 | 6608-2 | | | | |
| | 6609-6 | 6657-1 | | | | |
| | 6615-4-5 | 6676-3 | | | | |
| | 6689-4-15 | 6689-4-15 | | | | |
| | | 6692-3 | | | | |
| | | 6744-3 | | | | |
| Benches | 6462-5 | 6356-3 | 6652-5 | | | |
| | 6498-4 | 6448-6 | 6705-4 | | | |
| | 6513-5 | 6522-3 | | | | |
| | 6554-2-3 | 6531-3 | | | | |
| | 6599-4 | 6554-2-3 | | | | |
| | 6603-5 | 6607-3 | | | | |
| | 6609-6 | 6608-3 | | | | |
| | 6610-4 | 6657-3 | | | | |
| | 6615-5 | 6676-4 | | | | |
| | 6689-6 | 6689-6 | | | | |
| | | 6744-3 | | | | |
| Drainage | 6498-4 | 6356-4 | | | | |
| | 6513-5 | 6448-5 | | | | |
| | 6554-3 | 6522-3 | | | | |
| | 6603-3 | 6531-5 | | | | |
| | 6609-7 | 6554-3 | | | | |
| | 6610-4 | 6676-3 | | | | |
| | | 6744-10 | | | | |



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## NONMETAL MINING - Continued

### DEVELOPMENT - Continued

#### Surface - Continued

##### Stripping

| Bottom bench | | Top bench | | Hauling overburden | | | |
|---|---|---|---|---|---|---|---|
| Dry | Hydraulic | Dry | Wet | Wheelbarrow | Wagon | Truck | Cars |
| 6291-7 | 6291-22 | 6448-5 | 6537-5 | 6599-4 | 6657-1 | 6291-8-17 | 6607-3 |
| -17-22 | 6689-30 | 6615-5 | 6581-4 | | | -22 | 6610-7 |
| 6356-5 | | 6657-1 | | Conveyor belt | | 6554-3 | 6689-8-36 |
| 6405-3 | | 6689-19-20 | | 6462-6 | | 6615-5 | |
| 6448-5 | | -26-27 | | | | 6689-8-36 | |
| 6615-4 | | 6692-3 | | | | | |
| 6657-1 | | | | | | | |
| 6676-3 | | | | | Waste dump | | |
| 6689-17-23 | | | | | 6462-7 | | |
| 6744-3 | | | | | 6554-3 | | |
| Glory hole | | | | | | | |
| 6462-5 | | | | | | | |

##### Loading Overburden

| Hand | Scraper | | | | Shovel | Dragline | Crane |
|---|---|---|---|---|---|---|---|
| | Slip | Wheel | Caterpillar | Power | | | |
| 6291-8-17 | 6291-8-22 | 6657-2 | 6554-3 | 6689-20-27 | 6291-8-17 | 6448-5 | 6420-10 |
| 6448-5 | 6657-1 | | | -29 | -22 | 6537-5 | |
| 6609-6 | | | | | 6356-5 | 6581-4 | |
| | | | | | 6405-3 | 6689-19-26 | |
| | | | | | 6448-5 | | |
| | | | | | 6657-2 | | |
| | | | | | 6689-17-19 | | |
| | | | | | -23 | | |

##### Underground

| Shafts | | Adits | Drifts and tunnels | Raises |
|---|---|---|---|---|
| Vertical | Inclined | | | |
| 6152-4 | 6119-3 | 6151-4 | 6294-4 | 6294-5 |
| 6284-4 | 6277-3 | 6446-5 | 6384-4-5-6 | 6384-7 |
| 6294-3 | 6616-7-10 | | 6399-1 | 6691-18 |
| 6378-4 | 6691-17 | | 6446-6 | 6795-9 |
| 6602-1 | | | 6480-1 | |
| 6640-1 | | | 6598-1 | |
| 6691-17 | | | 6691-17 | |
| 6795-6 | | | 6795-8 | |



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## NONMETAL MINING - Continued

### MINING METHODS

#### Surface

| Bottom bench | | Top bench | | Hydraulic | | | |
|---|---|---|---|---|---|---|---|
| Dry | Hydraulic | Dry | Wet | Head and pressure | Giant flow | Water friction | Pipe flow |
| 6168-22 | 6689-30 | 6689-35 | 6420-3 | 6814-80 | 6814-81-90 | 6814-84 | 6814-88 -89 |
| 6356-2-4 | 6814-75 | 6692-4 | 6537-5 | | | | |
| 6448-4 | | 6798-23-40 | 6580-1 | | | | |
| 6498-4 | | 6814-45-55 | 6581-5 | | | | |
| 6513-5 | | | 6607-4 | | | | |
| 6522-3 | | | 6632-5 | | | | |
| 6554-3 | | | 6639-38 | | | | |
| 6599-4 | | | 6705-4 | | | | |
| 6607-3 | | | 6798-23-40 | | | | |
| 6608-3 | | | 6814-45-55 | | | | |
| 6609-6 | | | | | | | |
| 6615-5 | | | | | | | |
| 6657-3 | | | | | | | |
| 6689-15 | | | Dredging | | | | |
| 6692-4 | | | 6420-4-8 | | | | |
| 6705-4 | | | 6421-6 | | | | |
| 6744-3 | | | 6580-1 | | | | |
| 6798-7 | | | 6582-4 | | | | |
| | | | 6592-5 | | | | |
| | | | 6689-41 | | | | |
| Glory hole | | | 6696-2 | | | | |
| 6462-5 | | | | | | | |
| 6815-19 | | | | | | | |

#### Underground

| Room pillar | Open stopes | Square set | Shrinkage | Caving | Pillar support |
|---|---|---|---|---|---|
| 6119-4 | 6294-5 | 6294-6 | 6294-5 | 6795-10 | 6119-6 |
| 6151-4 | 6615-6 | | 6384-7 | | 6151-6 |
| 6152-4 | 6616-7 | | | | 6152-5-6 |
| 6160-9 | | | | | 6598-3 |
| 6446-5 | | | | | 6615-6 |
| 6480-5 | | | | | 6651-1 |
| 6615-6 | | | | | 6688-33 |
| 6662-5 | | | | | 6691-61 |
| 6795-11 | | | | | |



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## NONMETAL MINING - Continued

### MINING METHODS - Continued

#### Drilling

| Primary | | | | | | Secondary | |
|---|---|---|---|---|---|---|---|
| Piston | Hammer | Churn | Coyote | Feet per drill-shift | Tons per foot | Block-holing | Mud capping |
| 6291-8-22 | 6291-8-17 | 6291-8-17 | 6291-22 | 6356-2 | 6291-10 | 6291-8 | 6356-2 |
| 6356-2-6 | -22 | -22 | 6405-4 | 6405-5 | 6554-4 | 6356-2-7 | 6609-7 |
| -7 | 6405-4 | 6405-3 | 6599-4 | 6448-3-6 | 6603-5 | 6448-8 | |
| | 6446-5 | 6448-6 | 6609-6 | 6498-4 | 6610-5 | 6522-4 | |
| 2911-4 | 6603-5 | 6498-4 | | 6513-6 | 6615-6 | 6531-4 | |
| | 6609-6 | 6513-6 | 2911-4 | 6522-4 | 6616-8-11 | 6554-4 | Gadding |
| | 6615-5-6 | 6522-3 | | 6531-3 | | 6599-5 | 6498-4 |
| | 6616-7-10 | 6531-3 | | 6554-4 | 2911-4 | 6603-5 | |
| | 6795-11 | 6554-4 | | 6603-5 | | 6608-4 | |
| | | 6608-3 | | 6608-3 | | 6609-7 | Auger |
| | | 6609-6 | | 6610-5 | | 6610-6 | 6498-5 |
| | 2911-4 | 6610-5 | | 6615-5 | | 6744-4 | |
| | | 6744-4 | | 6744-4 | | | |
| | | 2911-4 | | | | | |

#### Blasting

| Primary | | | | | | Secondary | |
|---|---|---|---|---|---|---|---|
| General | | Churn drill | | Hammer drill | General | Block-holing | Mud capping |
| 6119-5 | 6446-5 | 6291-22 | 6744-4 | 6603-5 | 6356-7 | 6554-5 | 6554-5 |
| 6151-6 | 6480-6 | 6405-4 | | 6615-6 | 6405-6 | 6599-5 | 6609-7 |
| 6152-5 | 6598-3 | 6448-7 | 2911-5 | 6795-11 | 6448-8 | 6608-4 | |
| 6277-5 | 6602-7 | 6498-5 | | | 6498-5 | 6609-7 | |
| 6291-10-17 | 6615-6 | 6513-6 | | 2911-5 | 6513-6 | 6610-6 | |
| -22 | 6616-7 | 6522-4 | Coyote | | 6522-5 | 6615-6 | |
| 6356-7 | 6640-4 | 6531-3 | 6291-10-22 | | 6531-4 | | |
| 6378-5 | 6657-3 | 6554-4 | 6405-5 | | 6603-5 | | |
| 6384-9 | 6688-31 | 6608-3 | 6599-4 | | | | |
| 6399-3 | 6691-24 | 6610-5 | 6609-7 | | | | |



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NONMETAL MINING - Continued

MINING METHODS - Continued

Timbering

| | | | | | | |
|---|---|---|---|---|---|---|
| 6119-6 | 6151-7 | 6152-7 | 6277-7 | 6446-9 | 6602-9 | 6691-9-28 |

Loading

Surface

| Hand | Powershovel | | Dragline | Crane | Power scraper | Dredge pump | Dredge ladder |
|---|---|---|---|---|---|---|---|
| 6291-11-17 -23 | 6291-11-12 -17-23 | 6610-5-6 | 6537-5 | 6356-2 | 6798-3-5 | 6420-4-8 | 6421-6-7 -8 |
| 6356-2 | 6356-5-6 | 6657-3 | 6581-5 | 6421-14 | 6814-45 | 6580-1-4 | |
| 6582-1 | -8 | 6676-4 | 6607-4 | 6798-5-40 | | 6592-6-9 | 6582-1-4 |
| 6599-5 | 6405-7 | 6692-4 | 6652-5 | | | 6626-5 | 6798-5 |
| 6615-5 | 6448-8 | 6744-5 | 6676-3 | | Slackline | 6696-3 | |
| 6798-6 | 6498-5 | 6798-3-5 -9 | 6692-4 | Portable hopper | | 6798-5 | |
| | 6513-5-6 | | 6798-3-5 -28 | | 6580-1 | | Dipper |
| | 6522-5-12 | | | 6607-4 | 6652-9 | Cutter head | 6798-5 |
| 2911-6-7 | 6531-4 | Hydraulic bank caving | | 6692-4 | 6676-3 | 6592-9 | Clamshell |
| | 6554-6 | | | | 6705-3 | 6696-3 | |
| | 6592-9 | 6592-9 | | | 6798-3-5 | | 6626-23 |
| | 6603-5 | 6814-75 | | | 6814-55 | Under-water jet | 6696-4 |
| | 6607-4 | | | | | | 6798-5 |
| | 6608-4 | | | | | 6592-9 | |
| | 6609-7 | | | | | | |

Underground

| General | | | | Chutes | |
|---|---|---|---|---|---|
| 6119-6 | 6277-6 | 6446-7-8 | 6602-8 | 6294-7 | 6688-37 |
| 6151-7 | 6378-5 | 6480-5 | 6640-4 | 6384-8 | 6691-26 |
| 6152-6 | 6399-3 | 6598-3 | | 6495-1 | 6795-12 |



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## NONMETAL MINING - Continued

### MINING METHODS - Continued

#### Hauling

##### Surface

| Hand | Conveyor belt | Power scraper | Locomotive | | Pump and pipe | Tow boat | Aerial tram |
|---|---|---|---|---|---|---|---|
| | | | Steam | Gasoline | | | |
| 6291-12-17 | 6452-5 | 6798-3 | 6291-12 | 6291-12 | 6420-5 | 6421-11 | 6488-6 |
| 6356-2 | 6798-3 | 6814-45 | 6356-2-5 | 6405-3 | 6580-1 | 6580-7 | 6615-7 |
| 6599-5 | | | -6-7 | 6420-6 | 6592-6-9 | 6582-2-8 | 6696-5 |
| | | | 6405-7 | 6608-5 | 6696-3 | 6592-11 | |
| Rope and car | Auto truck | Slackline | 6448-5-8 | 6609-7 | 6798-3 | 6609-10 | |
| 6291-12-17 | 6291-12-17 | 6798-4 | 6498-5 | 6610-6 | Booster pump | 6798-4 | Central electric |
| 6420-6 | 6421-14 | 6814-55 | 6522-5-6 | 6615-6 | 6580-1 | | 6513-7 |
| 6554-6 | 6676-3 | | -11-12 | 6798-3 | 6592-9 | | 2911-9 |
| 6599-6 | 6798-3 | | 6531-4 | | | | Crane |
| 6607-5 | | | 6554-6 | 2911-9 | | | 6696-4 |
| 6676-4 | | | 6581-6 | | Pontoons | Barge | |
| | | Cableway | 6603-6 | Trolley | 6420-5 | 6421-11 | |
| | | 6744-6 | 6607-4 | 2911-9 | 6592-6-11 | 6580-7 | |
| | | | 6608-5 | | 6696-3 | 6582-2 | Ditch |
| 2911-9 | 2911-9 | | 6652-6 | | Pipe sleeves | 6592-11 | 6814-78 |
| | | | 6657-3 | Diesel | | 6609-10 | |
| Car dump | | | 6676-4 | 6610-6 | 6420-5 | 6626-6 | |
| 6405-7 | | | 6692-5 | | 6592-9 | 6696-5 | |
| | | | 6705-4 | | 6696-3 | 6798-4 | |
| | | | 2911-9 | | | | |

##### Underground

| Hand | Rope | Power scraper | Locomotive | | | Hoisting |
|---|---|---|---|---|---|---|
| | | | Trolley | Battery | Gasoline | |
| 6294-7 | 6446-10 | 6688-35 | 6119-7 | 6119-7 | 6615-6 | 6119-4 |
| 6384-9 | | | 6446-7-8 | 6151-8 | | 6152-4 |
| 6688-35 | | | 6795-12 | 6152-10 | | 6277-6 |
| 6795-12 | | | | 6384-9 | | 6378-6 |
| | | | | 6480-5 | | 6384-5-10 |
| | | | | | | 6487-1 |
| | | | | | | 6616-6-10 |
| | | | | | | 6621-4 |
| | | | | | | 6795-13-14 -15 |



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## NONMETAL MINING - Continued

### POWER

| Primary | | | | Secondary | | |
|---|---|---|---|---|---|---|
| 6151-10 | 6421-8-10 | 6582-7 | 6692-3 | 6356-4 | 6602-3 | 6621-4 |
| 6152-13 | -11 | 6602-3 | 6696-3 | 6522-12 | 6608-4 | 6744-10 |
| 6405-17 | 6448-11 | 6621-4 | | 6531-5 | 6609-10 | |
| 6446-7 | 6480-3 | 6626-4 | | 6554-3-4 | 6616-6-10 | |

### Installed Drive

| Churn drill | Power shovel | Power scraper | Dredge | | Hoist | Tow boat | Air compressor |
|---|---|---|---|---|---|---|---|
| | | | Pump | Ladder | | | |
| 6405-4 | 6513-6 | 6788-19 | 6357-4-6 | 6421-8-10 | 6607-5 | 6421-11 | 6522-12 |
| 6498-4 | 6610-6 | | 6420-4-8 | 6582-5 | 6621-4 | 6580-8 | 6554-4 |
| 6513-6 | 6705-4 | | 6580-2-3 | 6788-51-57 | 6676-4 | 6582-8 | 6608-4 |
| 6531-3 | 6788-28 | Slackline | -6 | | | 6609-10 | |
| 6554-4 | 2911-8 | 6652-9 | 6592-6 | | Engine plane | | |
| 6608-3 | | 6705-3 | 6626-5 | Spuds | | | |
| 6610-5 | | Aerial tram | 6696-3 | 6421-10 | 6554-6 | Water pump | Electric car |
| 6744-4 | Dragline | | | 6582-7 | 6607-5 | | |
| | 6537-5 | 6696-5 | Suction cutter | 6592-6 | 6676-4 | 6554-3 | 6513-7 |
| 2911-4 | 6581-4 | | | | | 6676-4 | |
| | 6652-5-6 | | 6592-6 | | | 6696-3 | |
| | 6692-3 | | 6696-3 | Warp | | 6744-10 | |
| | 6788-28 | | | 6421-10 | | | |
| | Crane | | Suction ladder | | | | |
| | 6696-4 | | 6696-3 | | | | |

### MINING EXTRACTION, PERCENT

| Surface | | | | Underground | | | |
|---|---|---|---|---|---|---|---|
| 6405-19 | 6599-7 | 6609-11 | 6626-5 | 6151-11 | 6334-10 | 6615-6 | 6652-10 |
| 6582-8 | 6608-10 | 6615-5 | 6744-11 | 6294-7 | 6446-13 | 6616-8-11 | 6795-16 |

### MINE DRAINAGE

| Surface | Underground | | |
|---|---|---|---|
| 6356-4 | 6119-13 | 6378-7 | 6616-6 |
| 6405-7 | 6152-10 | 6399-4 | 6640-4 |
| 6676-3 | 6277-7 | 6446-9 | 6795-15 |

### MINE VENTILATION

| | | | |
|---|---|---|---|
| 6119-13 | 6294-7 | 6446-9 | 6616-7 |
| 6151-9 | 6378-8 | 6480-6 | 6663-1 |
| 6152-10 | 6384-11 | 6585-1 | 6688-53 |
| 6277-7 | 6399-4 | 6598-3 | 6795-16 |



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## NONMETAL MINING - Continued

### WAGE - CONTRACT - BONUS

#### Surface

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6291-7-16 -21 | 6420-9 | 6513-9 | 6581-8 | 6603-6 | 6610-8 | 6657-4 | 6744-4-11 |
| 6356-2-9 | 6421-15 | 6522-13 | 6582-8 | 6607-17 | 6615-10 | 6676-7 | |
| 6405-19 | 6448-12 | 6531-14 | 6554-13 | 6608-10-11 | 6626-6 | 6692-11 | |
| | 6498-8 | 6580-14 | 6599-7 | 6609-11 | 6652-10 | 6696-7 | |

#### Underground

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6151-11 | 6152-16 | 6294-8 | 6378-8 | 6384-10 | 6446-13 | 6615-10 | 6616-8-10 |

### SAFETY AND ACCIDENT PREVENTION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6294-8 | 6405-19 | 6513-9 | 6554-12 | 6603-6 | 6609-12 | 6616-12 | 6692-10 |
| 6356-9 | 6446-13 | 6522-12 | 6580-14 | 6607-17 | 6610-8 | 6652-10 | 6696-7 |
| 6384-11 | 6498-9 | 6531-15 | 6599-7 | 6608-11 | 6615-10 | 6676-7 | 6795-17 |

### PLANT ORGANIZATION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6356-10 | 6498-10 | 6581-8 | 6603-6 | 6609-12 | 6652-10 | 6696-7 | 6795-18 |
| 6446-22 | 6531-15 | 6592-12 | 6607-20 | 6610-9 | 6657-6 | 6705-8 | |
| 6448-13 | 6580-14 | 6599-7 | 6608-11 | 6615-8 | 6692-12 | 6744-11 | |

### COSTS - DOLLARS

#### Prospecting

| Pipe | Orangepeel | Auger | Churn | Core | Pit |
|---|---|---|---|---|---|
| 6420-3 | 6420-3 | 6581-3 | 6156-14 | 6156-14 | 6581-3 |
| | | 6652-5 | 6384-3 | 6384-3 | 6607-3 |
| | | 6657-2 | 6405-21-23 | 6603-3 | 6652-5 |
| | | | 6446-4 | 6679-6 | 6692-3 |
| | | | 6448-3 | | |
| | | | 6679-5-6 | | |



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NONMETAL MINING - Continued

COSTS - DOLLARS - Continued

Development

Surface

| Labor | Super-vision | Comp. air drills, steel | Power | Fuel | Other supplies | Total | Hydraulic |
|---|---|---|---|---|---|---|---|
| 6356-10-11<br>6405-6-21<br>-23<br>6420-10<br>6448-14<br>6581-9<br>6657-6<br>6676-8<br>6692-11<br>6744-12 | 6405-21<br>6420-10<br>6581-9<br>6676-8<br>6744-12 | 6405-21 | 6448-14<br>6692-11 | 6356-10-11<br>6405-6-21<br>-23<br>6420-10<br>6448-14<br>6581-9<br>6657-6<br>6676-8 | 6356-10-11<br>6405-6-21<br>-23<br>6420-10<br>6448-14<br>6581-9<br>6657-6<br>6676-8<br>6692-11<br>6744-12 | 6291-8-17<br>6356-10<br>6405-21-23<br>6420-10<br>6448-14<br>6531-3-17<br>6581-9<br>6603-3<br>6657-6<br>6676-8<br>6692-11<br>6744-3 | 6291-22<br>Wheel scraper<br>6657-2<br>Royalty<br>6531-17 |

| Drilling | Loading | Hauling | Contract | Dump | Per ton over-burden | Per cubic yard over-burden | Per square yard surface |
|---|---|---|---|---|---|---|---|
| 6405-21 | 6356-10-11<br>6405-21-23<br>6657-2<br>6676-8 | 6356-10-11<br>6405-21-23<br>6657-2<br>6676-8<br>Track<br>6405-23 | 6531-17<br>6554-3 | 6356-10-11<br>6405-23 | 6356-10<br>6405-23<br>6554-3<br>6657-6<br>6692-12 | 6291-8-17<br>-22<br>6405-21<br>6448-5<br>6531-17<br>6581-9<br>6744-3<br>2911-3 | 6531-3 |

Underground

| Labor | Super-vision | Comp. air drills, steel | Power | Explosives | Timber | Other supplies | Total |
|---|---|---|---|---|---|---|---|
| 6294-9<br>6384-12<br>6599-5<br>6795-19 | 6294-9<br>6384-12 | 6294-9<br>6384-12 | 6294-9<br>6384-12<br>6795-19 | 6294-9<br>6384-12<br>6599-5<br>6795-19 | 6795-19 | 6294-9<br>6384-12 | 6294-9<br>6384-12<br>6795-19 |



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NONMETAL MINING - Continued

COSTS - DOLLARS - Continued

Mining

Surface

| Labor | Supervision | Comp.air drills, steel | Power | Fuel | Explosives | Supplies | Total |
|---|---|---|---|---|---|---|---|
| 6291-4-16 -21 6356-10-11 6405-6-21 6420-10 6421-16 6448-14-15 -16 6498-4-10 6513-11 6522-14 6531-17-19 6537-7 6554-14 6580-14-16 6581-9 6582-9 6592-12 6599-5-8 6603-7-9 6607-18-19 6608-3-11 6609-12-13 6610-9-10 -11 6615-10 6652-11-12 6657-5-6 6676-8 6692-11 6696-9-10 6705-10-11 6744-12 | 6356-10 6405-21 6420-10 6498-10 6537-7 6580-14 6581-9 6582-9 6592-12 6599-8 6603-7 6607-18 6608-12 6615-10 6652-11 6676-8 6696-10 6705-10 6744-12 | 6356-10 6405-21 6498-10 6513-11 6599-8 | 6356-10-11 6405-6-21 6420-10 6421-16 6448-14-15 -16 6498-10 6513-11 6522-14 6531-17-19 6537-7 6554-14 6580-14-16 6592-12 6599-8 6603-7-9 6607-18 6608-11-12 6609-12 6610-9-10 -11 6615-10 6626-6-7 6696-9-10 6705-10-11 6744-12 | 6356-10 6405-21 6448-14-15 -16 6498-10 6522-14 6531-17-19 6537-7 6580-14 6581-8-9 6582-9 6554-14 6592-12 6607-18 6608-11-12 6609-12-13 6610-10 6652-11-12 6657-5-6 6676-8 6705-10-11 6744-12 | 6356-10-11 6405-6-21 6448-14-16 6498-10 6513-11 6522-14 6531-17-19 6554-14 6599-5-8 6603-7-9 6608-11-12 6609-12-13 6610-9-11 6615-10 6744-12 | 6356-10-11 6405-6-21 6420-10 6421-16 6448-14-15 -16 6498-10 6513-11 6522-14 6531-17-19 6537-7 6554-14 6580-14-16 6581-9 6582-9 6592-12 6599-8 6603-9 6607-18 6608-3-11 -12-13 6609-12 6610-9-10 -11 6615-10 6652-11-12 6657-5-6 6676-8 6696-9-10 6705-10-11 6744-12 | 6291-4-5 -7-8-10 -11-12 -13-14 -16-21 6356-10 6405-21 6420-10 6421-16 6448-16 6498-10 6513-11 6522-14 6531-19 6537-7 6580-2 -14 6581-9 6582-9 6592-12 6599-8 6603-7-9 6607-18 6608-11 6609-12 6610-9 -11 6615-10 6652-11 -12 6657-6 6676-8 6696-9 -10 6705-10 -11 6744-12 2911-2 |



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NONMETAL MINING - Continued

COSTS - DOLLARS - Continued

Mining - Continued

Surface - Continued

| Development, stripping | Drilling | | Blasting | | Excavation | | Overhead |
|---|---|---|---|---|---|---|---|
| | Primary | Secondary | Primary | Secondary | Loading | Hauling | |
| 6291-5-8 | 6291-5-8 | 6291-10 | 6291-5-11 | 6291-11 | 6291-4-5 | 6291-5-12 | 6291-6-21 |
| -17-22 | -9-10-17 | 6356-10 | -17-22 | 6356-10 | -11-12-17 | -17-22-23 | 6356-10 |
| 6356-10-11 | -22 | 6405-21-24 | 6356-10 | 6405-7-21 | -22-23 | 6356-10 | 6405-21 |
| 6405-6-21 | 6356-10 | -25-28 | 6405-5-6 | -24-25-28 | 6356-10 | 6405-21-26 | 6420-10 |
| -24-28 | 6405-21-24 | 6448-14-16 | -21-24-28 | 6448-14-16 | 6405-21-25 | -28 | 6421-16 |
| 6420-10 | -28 | 6599-8 | 6448-14-16 | 6599-8 | -28 | 6421-16 | 6498-10 |
| 6448-5-14 | 6448-14-16 | 6603-7 | 6498-10-12 | 6603-5-7 | 6420-10 | 6448-14-15 | 6531-16 |
| -16 | 6498-4-10 | 6608-12 | 6513-11-13 | 6609-12 | 6421-16 | -16 | 6582-9 |
| 6522-14 | -12 | 6744-4-12 | 6531-16-17 | 6610-9 | 6448-14-16 | 6498-10-12 | 6603-7 |
| 6531-16-19 | 6513-11-13 | | -19 | 6744-12 | 6498-10 | 6513-11-13 | 6607-18 |
| 6537-7 | 6531-16-17 | | 6599-8 | | 6513-11 | 6531-16-17 | 6609-12 |
| 6554-14 | -19 | | 6603-5-7 | | 6531-16-17 | -19 | |
| 6581-9 | 6599-8 | | -8 | | -19 | 6580-14 | |
| 6603-3 | 6603-5-7 | | 6608-12 | | 6537-7 | 6581-9 | 2911-2 |
| 6615-10 | -8 | | 6609-12-13 | | 6580-14 | 6582-9 | |
| 6652-11 | 6608-3-12 | | 6610-9-11 | | 6581-9 | 6592-12 | |
| 6676-8 | 6609-12-13 | | 6615-10 | | 6582-9 | 6599-8 | |
| 6689-18-19 | 6610-5-9 | | 6744-12 | | 6592-12 | 6603-7-8 | |
| -21-24-25 | -11 | | | | 6599-8 | 6607-18 | |
| -27 | 6615-6-10 | | | | 6603-7-8 | 6608-11-12 | |
| 6692-11 | 6744-12 | | | | 6607-18 | 6609-12-13 | |
| 6696-9-10 | | | | | 6608-12 | 6610-9-11 | |
| 6744-3-12 | | | | | 6609-12 | 6615-10 | |
| 2911-3 | 2911-4 | 2911-4 | 2911-5 | 2911-5 | 6610-9-11 | 6652-11 | |
| | | | | | 6615-10 | 6676-8 | |
| | | | | | 6652-11-12 | 6692-11 | |
| | | | | | 6676-8 | 6696-9 | |
| | | | | | 6692-11 | 6705-10 | |
| | | | | | 6696-9-10 | 6744-12 | |
| | | | | | 6705-10 | | |
| | | | | | 6744-12 | | |
| | | | | | 2911-6-7 | 2911-9 | |
| | | | | | -8 | | |



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NONMETAL MINING - Continued

COSTS - DOLLARS - Continued

Mining - Continued

Surface - Continued

| Loading | | Dredging | | | Hauling | | |
|---|---|---|---|---|---|---|---|
| Shovel | Dragline | Pump | Ladder | Clamshell | Tow boat | Aerial tram | Miscel. |
| 6291-4-5 | 6652-12 | 6420-10 | 6421-16 | 6626-6 | 6421-16 | 6696-9 | 6420-10 |
| -6-12-13 | 6692-12 | 6421-16 | 6582-9 | | 6580-14 | | 6608-12 |
| -16-17-21 | 6607-20 | 6580-2-14 | | | 6582-9 | | 6705-11 |
| -23 | 6639-19 | -16 | | | | | |
| 6448-14 | | 6592-12 | | | | | |
| 6498-12 | | 6626-7 | | | | | |
| 6513-13 | | 6696-9-10 | | | | | |
| 6531-17 | | | | | | | |
| 6603-7-8 | | Dredge conveying | Total quarry | Maintenance | Repairs | Royalty | Power |
| 6607-20 | | | | | | | |
| 6608-13 | | 6420-10 | 6291-4-5 | 6420-10 | 6420-10 | 6531-17 | 6582-7 |
| 6609-12-13 | | | -7-8-10 | 6652-11 | 6448-14-15 | | |
| 6610-10-11 | | | -11-12-13 | 6705-11 | | | |
| 6657-6 | | | -14-16-21 | | Drill cable | | Water |
| 6689-18-19 | | | 6608-11 | | | | |
| 6705-10-11 | | | 2911-2 | | 6608-3 | | 6531-17-19 |
| 6744-12-13 | | | | | | | |

Underground

| Labor | Supervision | Comp.air drills, steel | Power | Explosives | Timber | Other supplies | Total |
|---|---|---|---|---|---|---|---|
| 6294-9 | 6294-9 | 6294-9 | 6294-9 | 6294-9 | 6294-9 | 6294-9 | 6294-9 |
| 6384-12 | 6384-12 | 6384-12 | 6384-12 | 6384-12 | 6384-12 | 6384-12 | 6384-12 |
| 6616-9-12 | | | 6795-19 | 6795-19 | 6795-19 | 6616-9-12 | 6616-9-12 |
| 6795-19 | | | | | | | 6795-19 |

| Development | | | | Transportation | | | Drilling cost per foot |
|---|---|---|---|---|---|---|---|
| In ore | In rock | Mining | Stoping | General | Haulage | Hoisting | |
| 6294-9 | 6294-9 | 6294-9 | 6795-19 | 6294-9 | 6446-18-21 | 6795-19 | 6405-6 |
| 6384-12 | 6384-12 | 6384-12 | | 6384-12 | 6795-19 | | 6599-5 |
| | 6795-19 | 6446-21 | | | | | |
| | | 6795-19 | | | | | |



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## NONMETAL MINING - Continued

### COSTS - DOLLARS - Continued

#### Mining - Continued

##### Underground - Continued

| General Underground | General surface | Drilling | Blasting | Hand loading | Shovel loading | Total | Coyote |
|---|---|---|---|---|---|---|---|
| 6294-9 | 6294-9 | 6405-6 | 6405-6 | 6446-8-10 | 6446-19-21 | 6294-9 | 6405-6 |
| 6384-12 | 6384-12 | 6446-21 | 6446-21 | -21 | | 6384-12 | 6599-5 |
| 6795-19 | | | 6599-5 | | | 6616-9 | |

### COSTS - MATERIAL UNITS

#### Mining

##### Surface

| Explosives | | | Fuel | Wire rope |
|---|---|---|---|---|
| General | Primary | Secondary | | |
| 6405-22 | 6291-11 | 6291-11 | 6405-22 | 6607-5 |
| 6498-11 | 6448-8 | 6448-8 | 6581-6 | 6652-5-9 |
| 6513-12 | 6522-5 | 6522-5 | 6582-10 | 6692-4 |
| 6522-5 | 6554-5 | 6554-5 | 6592-12 | |
| 6554-5 | 6610-5 | 6610-6 | 6607-5-19 | |
| 6599-8 | 6615-6 | 6615-6 | 6608-11 | |
| 6603-7-9 | 6744-5-13 | 6744-5-13 | 6609-7 | |
| 6608-4 | | | 6615-10 | |
| 6610-5-10 | 2911-5 | 2911-5 | 6652-6-11 | |
| 6615-6-10 | | | 6744-13 | |

##### Underground

| Explosives | Timber |
|---|---|
| 6294-10 | 6294-10 |
| 6384-13 | 6384-13 |
| 6446-7-20 | 6795-20 |
| 6616-8-11 | |
| 6795-20 | |



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## NONMETAL MINING - Continued

### COSTS - LABOR UNITS

### Development

#### Stripping

| Supervision | Loading | Hauling | Track | Total | Tons per man-shift |
|---|---|---|---|---|---|
| 6356-12 | 6356-12 | 6356-12 | 6356-12 | 6420-11 | 6356-11 |
| 6405-22 | 6405-22 | 6405-22 | | 6448-16 | 6405-22 |
| 6676-9 | 6652-11 | 6652-11 | | 6581-9 | |
| 6692-12 | 6676-9 | 6676-9 | Dump | 6676-9 | |
| | 6692-12 | | 6356-12 | | |

### Mining

#### Surface

| Super-vision | Drilling | Blasting | Loading | Hauling | Track | Total mining | Tons per man-shift |
|---|---|---|---|---|---|---|---|
| 6356-12 | 6356-12 | 6356-12 | 6356-12 | 6356-12 | 6356-12 | 6291-7-21 | 6356-11 |
| 6405-22 | 6405-22 | 6405-22 | 6405-22 | 6405-22 | 6615-10 | 6421-17 | 6405-22 |
| 6498-11 | 6498-11 | 6498-11 | 6448-16 | 6448-16 | 6657-5 | 6498-11 | 6498-11 |
| 6581-9 | 6513-12 | 6513-12 | 6498-11 | 6498-11 | | 6513-11 | 6513-12 |
| 6599-8 | 6599-8 | 6599-8 | 6513-12 | 6513-12 | | 6522-15 | 6580-15 |
| 6603-7 | 6603-7 | 6603-7 | 6580-15 | 6530-15 | Repairs | 6581-9 | 6582-10 |
| 6676-9 | 6610-10 | 6610-10 | 6599-8 | 6581-9 | 6356-12 | 6608-13 | 6599-8 |
| 6692-12 | 6615-10 | 6615-10 | 6603-7 | 6599-8 | 6657-5 | 6676-9 | 6603-7 |
| 6744-13 | 6744-13 | 6744-13 | 6607-19 | 6603-7 | | 6692-12 | 6607-19 |
| | | | 6610-10 | 6607-19 | | 6705-10 | 6608-13 |
| | | | 6615-5-10 | 6608-13 | | 6744-13 | 6615-10 |
| | | | 6652-11 | 6610-10 | | | 6676-9 |
| | | | 6657-5 | 6615-10 | | | 6692-12 |
| | | | 6676-9 | 6652-11 | | | 6744-13 |
| | | | 6692-12 | 6657-5 | | | |
| | | | 6744-13 | 6676-9 | | | |
| | | | | 6692-12 | | | |
| | | | | 6744-13 | | | |

#### Dredging

| Pump | Ladder | Tow boat |
|---|---|---|
| 6420-11 | 6421-17 | 6421-17 |
| 6421-17 | 6532-10 | 6582-10 |
| 6592-12 | | |



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NONMETAL MINING - Continued

COSTS - LABOR UNITS - Continued

Mining - Continued

Underground

| Breaking | Timbering | Mucking | Tramming | Hauling | Hoisting | Super vision | General underground |
|---|---|---|---|---|---|---|---|
| 6294-10<br>6384-13<br>6446-20 | 6294-10<br>6384-13 | 6294-10<br>6384-13<br>6446-20 | 6294-10 | 6384-13<br>6446-20 | 6294-10<br>6384-13 | 6294-10<br>6384-13<br>6446-20 | 6294-10<br>6384-13 |

| Filling | Total underground | Tons per man-shift | Feet per drill-shift | Tons per drill-shift |
|---|---|---|---|---|
| 6334-13 | 6294-10<br>6384-13<br>6446-20<br>6795-20 | 6294-10<br>6384-13<br>6446-20 | 6446-17 | 6446-17 |

COSTS - POWER UNITS

Mining

Surface

| Compressed air | Drilling | Dredging, pump | Excavation: Shovels | Excavation: Dragline | Hauling, general | Pumping | Total Mining |
|---|---|---|---|---|---|---|---|
| 6405-22<br>6607-19<br>6615-10<br>6744-13 | 6405-22<br>6498-11<br>6513-12<br>6603-7<br>6610-10<br>6744-13 | 6357-1<br>6420-11<br>6580-15<br>Ladder<br>6582-10 | 6513-12<br>6603-7<br>6610-10<br>6615-10<br>6705-10<br>6744-13 | 6692-12<br>Storage<br>6421-17 | 6615-10<br>6676-9<br>6744-13<br>Cableway<br>6744-13 | 6582-10<br>6705-10<br>6744-13 | 6599-8<br>6603-7<br>6608-13<br>6705-10<br>6744-13 |

Underground

| Compressed air | Loading | Hauling | Hoisting | Pumping | Lighting | Ventilation | Total |
|---|---|---|---|---|---|---|---|
| 6294-10<br>6284-13<br>6446-20 | 6446-20 | 6446-20 | 6294-10<br>6384-13 | 6294-10<br>6384-13 | 6294-10<br>6384-13 | 6384-13 | 6294-10<br>6384-13<br>6795-20 |



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# NONMETAL MILLING

## SAMPLING

| | | | |
|---|---|---|---|
| 6488-8 | 6607-16 | 6608-6 | 6621-11 |

## ORE ANALYSES

6488-7-14-15-16

## FLOW SHEETS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6405-6 | 6513-14 | 6554-14 | 6592-8-10 | 6608-4 | 6615-11 | 6652-6 | 6744-8 |
| 6446-10 | 6531-4 | 6581-10 | 6599-8 | 6609-14 | 6621-6 | 6692-6 | |
| 6488-6 | 6553-8 | 6582-10 | 6607-20 | 6610-4 | 6626-4 | 6705-6 | |

## MILLING DETAILS

### Crushing

#### Primary

| Mine or pit | Jaw | | Gyratory | | Single roll | Hammer mill | Disk |
|---|---|---|---|---|---|---|---|
| 6553-1 | 6291-13-18 | 6599-6 | 6291-23 | 6696-6 | 6498-6 | 6513-8 | 6626-4 |
| 6554-7 | -23 | 6603-6 | 6356-8 | 6705-5 | 6608-5 | 6554-9 | |
| 6609-7 | 6356-8 | 6609-7 | 6405-8 | 6744-7 | | | |
| | 6405-8 | 6615-7 | 6446-10 | | | | |
| | 6448-9 | 6621-6 | 6522-9 | | | | |
| | 6488-6-7 | 6652-6 | 6581-6 | | | | Dry pan |
| | 6531-5 | 6676-4 | 6592-6 | | | | 6498-7 |
| | 6553-1 | | 6607-6 | | | | |
| | 6554-7 | | 6610-7 | | | | |
| | 6580-8 | 2911-10 | 6692-7 | 2911-10 | 2911-10 | 2911-10 | |

#### Secondary

| Gyratory | | Hammer mill | | Rolls | Cone | Jaw | Disk |
|---|---|---|---|---|---|---|---|
| 6291-13-18 | 6609-7 | 6356-8 | 6608-5 | 6291-13 | 6291-13 | 6291-13-23 | 6291-13 |
| -23 | 6610-7 | 6448-9-10 | | 6488-12-19 | 6405-10 | 6580-10 | -18 |
| 6405-9 | 6615-7 | 6498-6 | | 6621-6-7 | 6607-7 | 6676-5 | 6607-7 |
| 6531-6-7 | 6692-8 | 6522-9 | | 6705-6 | 6609-8-9 | | 6692-7 |
| 6554-8 | 6744-8 | 6553-2 | | | 6744-7 | | 6705-6 |
| 6603-6 | 2911-10 | 6554-8-9 | 2911-10 | 2911-10 | | 2911-10 | |



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NONMETAL MILLING - Continued

MILLING DETAILS - Continued

Grinding

| Ball mill | Tube mill | Pebble mill | Fuller Lehigh | Bradley Hercules | Chaser |
|---|---|---|---|---|---|
| 6488-9 | 6448-11 | 6488-9-17 | 6554-10 | 6448-10 | 6405-10 |
| 6498-6-7 | 6488-9-18 | -18 | 6608-9 | | |
| -8 | 6498-7 | 6553-3 | | | |
| 6522-9 | 6513-8 | 6610-8 | | | |
| 6553-3 | 6522-9 | | | | |
| 6554-10 | 6553-3 | | | | |
| 6608-8 | | | | | |

Washing

| | | | | | | |
|---|---|---|---|---|---|---|
| 6405-9 | 6537-5-6 | 6581-6 | 6607-8-9 | 6626-3 | 6692-5-6 | 6744-8 |
| 6421-8-9 | -7 | 6582-5-6 | -10-11 | 6652-7-9 | -8-9 | |
| -10 | 6580-9-12 | 6609-8 | 6621-6 | 6676-5-6 | 6705-5-6 | |

Conveying

Feeders

| Chute gate | | Plate | Pan | Spreading table | Grizzly | Apron | Table |
|---|---|---|---|---|---|---|---|
| 6554-10 | 6652-9 | 6537-5 | 6513-8 | 6420-5 | 6448-9 | 6488-6-17 | 6553-2 |
| 6580-8-12 | 6676-4 | 6607-5 | 6581-6 | 6592-6 | 6676-4 | 6553-2 | 6610-8 |
| 6599-6 | 6692-5 | 6608-5 | 6608-5 | 6626-3 | | | |
| 6607-4-14 | 6705-5-7 | 6652-6 | 6609-7 | | | | |
| 6609-9 | 6795-12 | 6692-5 | 6621-6 | Screw | Cradle | Cylindrical | |
| 6626-3 | | | | 6498-7 | 6554-8-9 | 6580-8 | |



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## NONMETAL MILLING - Continued

### MILLING DETAILS - Continued

#### Conveying - Continued

##### Conveyors

| Belt | | | Launder | | Screw | Bucket | Pump |
|---|---|---|---|---|---|---|---|
| 6356-9 | 6580-7-8 | 6652-8-9 | 6421-9 | | 6448-11 | 6448-9 | 6553-3 |
| 6405-8-9 | -10-11-12 | 6676-4-5 | 6553-3 | Lining | 6498-6 | 6498-6 | 6607-12 |
| 6421-7-12 | 6581-6 | 6692-5 | 6582-7 | 6421-9 | 6553-2 | 6603-6-7 | 6609-10 |
| -13 | 6592-7 | 6696-5-6 | 6592-7 | 6488-9 | 6554-10 | | 6610-8 |
| 6446-11 | 6607-5-6 | 6705-5-6 | 6621-8 | 6580-10 | 6608-8 | Chain drag | 6692-8 |
| 6448-10 | -8-9 | -7 | 6626-5 | 6582-7 | 6626-4 | | |
| 6488-6-7 | -10-13 | 6744-8 | 6652-7 | 6607-7 | | 6554-9 | |
| -17-18-19 | 6608-5-6 | | 6676-6 | 6609-9 | | | Booster |
| 6498-6 | -7 | | 6696-4 | 6621-8 | | | 6607-12 |
| 6513-8 | 6609-7-8 | Sorting | | 6705-5 | Shaking | Pneumatic | |
| 6522-11 | -9-10 | 6488-6 | | | 6621-8 | 6554-10 | |
| 6531-6-7 | 6610-7 | 6580-10 | Chutes | | 6553-3 | | Pipe |
| 6537-5-6 | 6615-7 | 6621-6 | 6421-7 | | | | 6580-10 |
| 6553-2 | 6621-6-9 | | 6580-10-12 | | Apron | Pan | 6607-12 |
| 6554-8-9 | 6626-3-4 | | 6609-8 | | 6446-11 | 6498-6 | 6609-10 |
| -10 | 6652-6-7 | | | | | | 6692-8 |

##### Miscellaneous

| Car dumper | | Barge unloader | Car & barge puller | Crane | Wheel-barrow |
|---|---|---|---|---|---|
| 6446-10 | 6705-4 | 6421-12 | 6531-5-11 | 6513-8 | 6488-7 |
| 6448-9 | 6795-13 | 6580-7 | 6553-2 | 6522-11 | 6599-4 |
| 6522-6 | | 6582-2 | 6580-7-13 | 6592-7 | |
| 6531-5 | | | 6582-7 | | |
| 6553-2 | | | 6592-9 | | |
| 6554-7 | Loader | Loader | 6626-5 | | |
| 6608-5 | 6420-7 | 6592-7 | | | |
| 6609-7 | 6652-10 | 6609-10 | | | |
| 6610-7 | 6676-6 | 6696-5 | | | |
| 6676-4 | | | | | |

##### Elevating

| Bucket and belt | | | Bucket and chain | | Cont.bucket | Pan |
|---|---|---|---|---|---|---|
| 6356-8-9 | 6531-7 | 6621-8 | 6446-11 | 6608-7-8 | 6421-7-9 | 6513-8 |
| 6405-8-10 | 6553-2 | 6692-9 | 6522-12 | 6621-6 | -10 | |
| 6448-9-10 | 6554-8-9 | 6705-6 | 6554-9-10 | 6692-7 | 6498-6 | |
| -11-17 | 6592-7 | | 6603-6 | 6744-7 | 6582-6 | |
| -18-19 | 6599-6 | | 6608-5-6 | | 6692-9 | |
| | | | | | 6696-6 | |



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## NONMETAL MILLING - Continued

### MILLING DETAILS - Continued

#### Sizing

##### Grizzlies

| Mine bar | Mill bar | | | | Plate | Roll |
|---|---|---|---|---|---|---|
| 6621-6 | 6356-8 | 6603-6 | 6615-7 | 2911-12 | 6405-9 | 6446-10 |
| 6692-5 | 6421-8 | 6607-10 | 6652-6 | | 6744-7 | |
| | 6488-6 | 6609-8 | 6676-4 | | | |
| | 6581-6 | 6610-7 | 6692-5 | | | |

##### Screens

| Trommel | | | | Vibrator | | Stationary | Shaking |
|---|---|---|---|---|---|---|---|
| Washing | Scalper | Sizing | | | | | |
| 6421-9 | 6405-9 | 6405-9-10 | 6705-6 | 6405-9 | 6624-17 | 6420-5-6 | 6705-5-6 |
| 6537-5 | 6420-5 | 6420-6-9 | 6744-8 | 6420-8 | 6652-8 | -7 | |
| 6581-6 | 6421-9 | 6421-7-9 | | 6421-7-9 | 6676-4 | 6537-5-6 | 2911-12 |
| 6621-6 | 6531-6-7 | 6446-11 | 2911-12 | 6446-11 | 6692-6 | 6630-9-11 | |
| 6652-7-9 | 6580-9-10 | 6531-6-7 | | 6488-9-12 | 6696-6 | 6615-7 | |
| 6692-5-8 | 6599-6 | -8 | | -18 | 6705-6 | 6626-7 | |
| 6705-5 | 6603-6 | 6553-3 | | 6522-9 | 6744-8 | 6696-4 | |
| 6788-58 | 6607-6-7 | 6554-8 | Conical | 6531-7-8 | | | |
| | 6609-8 | 6582-5 | 6581-6-7 | 6553-2 | 2911-12 | | |
| | 6621-7 | 6592-6-7 | 6607-10 | 6554-9 | | | |
| | 6626-3 | 6607-8-9 | 6676-5 | 6580-9-11 | | | |
| | 6652-7 | -10 | | -12 | | | |
| | 6692-5 | 6609-8 | | 6581-7 | | | |
| | 6705-5 | 6624-16 | | 6582-6 | | | |
| | 6744-8 | 6692-7-8 | | 6609-8-9 | | | |
| | 2911-12 | 6696-4 | | 6621-8-9 | | | |

##### Classifiers

| Drag | Sluice | Wheel | Box | Cone | Hydraulic | Calculations | Pneumatic |
|---|---|---|---|---|---|---|---|
| 6537-5 | 6580-10 | 6696-4 | 6580-10 | 6420-6-8 | 6408-13 | 6404-9-10 | 6488-9-12 |
| 6607-13 | 6696-4 | 6705-6 | | | 6420-8 | | -18 |
| 6652-7 | | | | | 6476-6 | | 6608-8 |

##### Screen Analyses

| Mill | | | | | Crushers | | |
|---|---|---|---|---|---|---|---|
| Sand | Gravel | Base rock | Heads | Concentrates | Primary | Secondary | Hammer mill |
| 6537-4 | 6537-4 | 6609-11 | 6446-15 | 6621-15 | 6446-15 | 6446-15 | 6498-6 |
| 6705-3 | 6705-3 | | 6621-14 | | 6522-8 | 6553-4 | 6513-8 |
| | | | | | 6553-4 | | 6522-8 |
| | | | | | | | 6553-4 |



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## NONMETAL MILLING - Continued

### MILLING DETAILS - Continued

#### Sizing - Continued

##### Screen Analyses - Continued

| Grinders | | | Screens | | | | |
|---|---|---|---|---|---|---|---|
| Ball mill | Tube mill | Pan | Grizzly | Scalper | Trommel | Vibrator | Table |
| 6498-7-8<br>6522-8<br>6553-4<br>6608-8-9 | 6522-8<br>6553-4 | 6448-11<br>6498-8 | 6405-11 | 6405-11<br>6446-15 | 6405-11 | 6405-11<br>6446-15 | 6621-17 |

##### Concentration

| Dry | | | Wet | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Jig | | | |
| Hand | Magnetic | Electric precipitation | Table | Harz | Hancock | Pulsator | Ratio |
| 6488-6<br>6615-4<br>6621-6-18<br>6652-6-7 | 6488-12 | 6554-10 | 6621-8 | 6621-7-10 | 6621-9 | 6621-7 | 6621-18 |

##### Dewatering

| Drag | Thickeners, V tank | Tank | Driers | |
|---|---|---|---|---|
| 6621-8-9<br>6705-5-6 | 6621-8-9<br>6626-4<br>6676-6 | 6621-9<br>6592-7<br>6692-8 | 6420-6<br>6448-10<br>6488-8 | 6498-6<br>6554-9<br>6608-7 |

##### Waste Disposal

| Pump | Launder | Crane |
|---|---|---|
| 6580-10<br>6607-12 | 6621-10 | 6652-7 |

##### Storage

| General | Crane | Power scraper | Dragline | Slackline | Shovel | Truck | Launder |
|---|---|---|---|---|---|---|---|
| 6405-13<br>6420-6-8<br>-9<br>6421-12<br>6531-11<br>6580-12<br>6609-9 | 6421-14<br>6581-8<br>6607-14-15<br>6610-7<br>6692-10<br>6696-5<br>6705-7<br>6744-9 | 6421-14 | 6537-6 | 6652-8 | 6676-7 | 6676-7 | 6676-7 |



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## NONMETAL MILLING - Continued

### WATER SUPPLY

| Salt | Fresh | | | | |
|---|---|---|---|---|---|
| | Pond | River | Well | Mine | Reclaimed |
| 6609-10 | 6420-9<br>6531-13<br>6580-9<br>6581-8<br>6652-5-7<br>6676-4-6<br>6692-9 | 6582-6<br>6621-2<br>6676-6<br>6696-6 | 6607-15<br>6692-9<br>6705-8 | 6609-10 | 6621-2 |

### POWER SUPPLY

| Primary | | | | | Secondary | | |
|---|---|---|---|---|---|---|---|
| | Electric | | | | | | |
| Steam | Purchased | | Diesel | Steam | Compressed air | Electric direct | Fuel oil |
| 6420-4-8<br>6421-10 | 6488-19<br>6531-13<br>6581-7<br>6592-9<br>6607-15<br>6609-10 | 6692-9<br>6696-7<br>6705-7<br>6744-10 | 6599-6<br>6609-10<br>6615-10<br>6626-4-5 | 6531-13<br>6553-7<br>6621-3 | 6405-14<br>6531-12<br>6580-12<br>6609-10-15<br>6621-4<br>6744-10 | 6609-15<br>6621-19-20 | 6609-10 |

### Installed Drive

| Crushing | | | | Grinding | | | |
|---|---|---|---|---|---|---|---|
| Gyratory | Jaw | Hammer mill | Cone | Ball mill | Pebble mill | Water supply | Drying |
| 6356-8<br>6405-8-9<br>6446-10<br>6522-9<br>6531-6<br>6554-8<br>6581-8<br>6603-6<br>6607-6<br>6609-8<br>6610-7<br>6692-7<br>6696-6<br>6705-5<br>6744-7-8 | 6356-8<br>6405-8<br>6448-9<br>6488-6-17<br>6531-5<br>6553-1<br>6554-7<br>6580-8-10<br>6599-6<br>6603-6<br>6609-7-15<br>6621-16-19<br>6652-7 | 6356-9<br>6448-9-10<br>6498-6<br>6513-8<br>6522-9<br>6553-2<br>6554-8-9<br>6608-5 | 6405-10<br>6607-8<br>6609-8-9<br>-15<br>6744-7 | 6498-6-8<br>6522-10<br>6553-3<br>6554-10<br>6608-8 | 6488-17-18<br>6553-3<br>6610-8 | 6607-15<br>6621-2<br>6676-6<br>6692-9<br>6696-6<br>6705-8<br>6744-8 | 6420-6<br>6448-10<br>6488-8<br>-17<br>6498-7<br>6554-9<br>6608-7 |
| | | | Disk | Tube mill | Other mills | | Fan |
| | | | 6607-8<br>6705-7 | 6448-11-18<br>6498-7<br>6513-8<br>6522-10<br>6553-3 | 6405-10<br>6448-10<br>6498-7<br>6554-10<br>6608-9 | Washer<br>6421-10<br>6621-16<br>6705-5 | 6621-20<br>6554-9<br>-10<br>6609-15 |
| | | Rolls | Single roll | | | | |
| | | 6488-19<br>6621-16-19<br>6705-6 | 6498-6<br>6608-5 | | | | |



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## NONMETAL MILLING - Continued

### POWER SUPPLY - Continued

#### Installed Drive - Continued

##### Sizing

| Trommel | | | Vibrator | | Classifier | | Grizzly |
|---|---|---|---|---|---|---|---|
| 6405-9-10 | 6607-6-7 | 6705-5-6 | 6405-9 | 6692-6 | | | 6446-10 |
| 6421-10 | -9-11 | 6744-8 | 6488-18 | 6744-8 | Drag | Wheel | |
| 6531-6-8 | 6609-9-15 | 6788-57 | 6531-7 | | 6607-13 | 6696-4 | |
| 6554-8 | 6621-16-19 | | 6580-12 | | 6621-16-20 | 6705-6 | |
| 6580-9 | 6626-3 | Conical | 6581-8 | Shaker | 6652-7 | | |
| 6581-8 | 6652-10 | | 6609-9-15 | | 6705-6 | | |
| 6582-5 | 6692-5-7 | 6607-11 | 6621-16-20 | 6705-5 | | | |
| 6592-6-7 | -8-9 | 6676-6 | 6676-4 | | | | |

##### Conveying

| Belt | | Pump | Elevator | Feeder | Aerial tram | Barge spotter | Concentration |
|---|---|---|---|---|---|---|---|
| 6405-8 | 6621-16-19 | 6420-9 | 6356-8-9 | 6448-9 | 6488-6-17 | 6421-12 | |
| 6421-12-13 | -20 | 6421-10 | 6405-8-10 | 6513-8 | 6615-7 | 6609-15 | Jigs |
| -14 | 6652-6-7 | 6531-13 | 6421-10 | 6553-2 | | Barge unloader | 6621-16-19 |
| 6488-17-18 | -8-9 | 6537-7 | 6448-10-11 | 6607-4-5 | Crane | 6421-14 | |
| -19 | 6676-5-7 | 6580-9-10 | -17-18-19 | 6609-7-15 | 6610-7 | | Tables |
| 6498-6-7 | 6692-5 | 6581-8 | 6498-7 | 6621-16-19 | 6744-9 | | 6621-16-19 |
| 6513-8 | 6705-5-6 | 6582-6-7 | 6513-8 | 6652-6 | Engine plane | | |
| 6531-6-7 | -7 | 6592-9 | 6531-7 | | 6467-3 | | |
| 6553-3 | 6744-8 | 6607-12 | 6553-2 | | 6476-3 | Compressed air | |
| 6554-9 | | 6609-10-15 | 6554-8-10 | Screw | Car spotter | 6580-12 | |
| 6580-7-8 | | 6610-8 | 6582-6 | 6448-11 | 6421-14 | 6609-15 | |
| -10-11-12 | Bucket | 6621-16-19 | 6592-7 | 6498-7 | 6531-5 | 6744-10 | |
| 6581-8 | 6443-9 | 6652-5-7 | 6608-5-6 | 6553-3 | Car dumper | | |
| 6607-6-7 | 6498-6 | 6657-4 | -7 | 6608-8 | 6448-9 | | |
| -8-10-13 | 6608-6 | 6676-4 | 6621-16-19 | | 6609-7 | | |
| 6609-8-9 | | 6692-8 | -20 | | | | |
| -10-15 | | 6788-57 | 6692-7-9 | | | | |
| | | | 6744-7 | | | | |



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NONMETAL MILLING - Continued

COSTS - DOLLARS

| Labor | Super-vision | Power | Power unit | Fuel | Supplies | Repairs | Total |
|---|---|---|---|---|---|---|---|
| 6291-4 | 6405-21 | 6356-12 | 6488-19 | 6405-21 | 6356-12 | 6488-20 | 6291-4 |
| 6356-12 | 6420-10-11 | 6405-21 | 6513-12 | 6420-11 | 6405-21 | 6531-18 | 6356-12 |
| 6405-21 | 6498-10 | 6420-10-11 | 6553-7 | 6443-15-16 | 6420-10-11 | 6581-9 | 6405-21 |
| 6420-10-11 | 6531-19 | 6448-15-16 | 6592-9 | 6488-20 | 6448-15-16 | 6696-9 | 6420-10-11 |
| 6448-15-16 | 6537-7 | 6488-20-21 | 6599-7 | 6498-6-10 | 6488-20-21 | 6705-11 | 6448-16 |
| 6488-20-21 | 6580-14 | 6498-10 | 6607-15 | 6522-14 | 6498-10 | | 6488-20 |
| 6498-10 | 6581-9 | 6513-11 | 6615-10 | 6531-18-19 | 6513-11 | | 6498-10 |
| 6513-11 | 6592-12 | 6522-14 | 6621-18 | 6537-7 | 6522-14 | Water | 6522-14 |
| 6522-14 | 6607-18 | 6531-18-19 | 6676-8 | 6554-14 | 6531-18-19 | 6621-18 | 6531-19 |
| 6531-18-19 | 6615-10 | 6537-7 | 6692-9 | 6592-12 | 6537-7 | 6531-17-18 | 6537-7 |
| 6537-7 | 6652-11 | 6553-7 | 6705-7 | 6607-18 | 6553-7 | -19 | 6580-14 |
| 6553-7 | 6676-8 | 6554-14 | 6744-10 | 6608-13 | 6554-14 | | 6581-9 |
| 6554-14 | 6696-9-10 | 6580-14 | | 6615-10 | 6580-14 | | 6592-12 |
| 6580-14 | 6705-10 | 6581-9 | | | 6581-7 | Balls | 6607-18 |
| 6581-9 | 6744-12 | 6592-12 | | | 6592-12 | 6522-9 | 6608-11 |
| 6592-12 | | 6607-18 | | | 6607-18 | 6608-9 | 6609-12 |
| 6607-18 | | 6608-11-12 | | | 6608-11-12 | | 6610-9 |
| 6608-11-12 | | -13 | | | -13 | | 6615-10 |
| -13 | | 6609-12 | | | 6609-12 | | 6616-9-12 |
| 6609-12-13 | | 6610-9 | | | 6610-9 | Liners | 6626-6-7 |
| 6610-9 | | 6615-10 | | | 6615-10 | 6522-9 | 6652-11 |
| 6615-10 | | 6621-18 | | | 6621-18 | | 6676-8 |
| 6621-18 | | 6652-11 | | | 6652-11 | | 6692-11 |
| 6652-11 | | 6676-8 | | | 6676-8 | | 6696-10 |
| 6676-8 | | 6692-11 | | | 6692-11 | | 6705-10 |
| 6692-11 | | 6696-9-10 | | | 6696-9-10 | | 6744-12 |
| 6696-9-10 | | 6705-10-11 | | | 6705-10-11 | | |
| 6705-10-11 | | 6744-12 | | | 6744-12 | | |
| 6744-12 | | | | | | | |

Miscellaneous

| Waste disposal | Launders | Sheeting mica | Royalty | Engine plane | Hauling | Aerial tram | Sampling |
|---|---|---|---|---|---|---|---|
| 6531-16-19 | 6580-14 | 6616-9-12 | 6626-6-7 | 6607-18 | 6420-11 | 6488-20 | 6488-20 |
| 6692-8 | | | | | | 6615-10 | 6608-11 |
| | | | | | | 6696-10 | |



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## NONMETAL MILLING - Continued

### COSTS - DOLLARS - Continued

| Primary crushing | Secondary crushing | Grinding | Screening | Conveying | Washing | Storage | Miscel. |
|---|---|---|---|---|---|---|---|
| 6291-4-5 | 6291-14-18 | 6405-21 | 6291-16-21 | 6291-24 | 6291-24 | 6291-5-24 | 6291-6 |
| -14-16-17 | -23 | 6448-14-15 | -23-24 | 6405-21 | 6405-21-26 | 6405-21-26 | 6405-21-28 |
| -18-21-23 | 6405-21-26 | -16 | 6405-21-26 | 6448-16 | -28 | -27-28 | 6420-11 |
| 6356-12 | -28 | 6488-20-21 | -28 | 6488-20 | 6537-7 | 6421-16 | 6488-20 |
| 6405-21-26 | 6448-14-15 | 6498-10 | 6420-10-11 | 6498-10 | 6580-14 | 6448-14-15 | 6498-10 |
| -28 | -16 | 6513-11 | 6531-16-18 | 6513-11 | 6581-9 | -16 | 6513-11 |
| 6448-14-15 | 6488-20 | 6522-15 | 6537-7 | 6580-14 | 6592-12 | 6537-7 | 6537-7 |
| -16 | 6531-16-18 | 6553-6 | 6580-14 | 6607-18 | 6607-18 | 6607-18 | 6580-14 |
| 6498-10 | -19 | 6554-14 | 6581-9 | 6608-12-13 | 6652-11 | 6609-12 | 6581-9 |
| 6513-11 | 6554-14 | 6610-9 | 6592-12 | 6609-12 | 6676-8 | 6676-8 | 6607-18 |
| 6531-16-18 | 6580-14 | | 6607-18 | 6610-9 | 6744-12 | 6696-9-10 | 6609-12 |
| -19 | 6607-18 | | 6609-12 | 6615-10 | | 6705-10-11 | 6610-9 |
| 6553-7 | 6676-8 | | 6615-10 | 6626-6 | | 6744-12 | 6615-10 |
| 6554-14 | 6744-12 | | 6626-6 | 6676-8 | Drying | | 6676-8 |
| 6580-14 | | | 6676-8 | 6696-9-10 | 6420-11 | 2911-11 | 6692-11 |
| 6592-12 | 2911-10-11 | | 6692-11 | 6744-12 | 6448-14-15 | | 6696-9-10 |
| 6607-18 | | | 6696-9-10 | | -16 | | 6705-10-11 |
| 6608-11-12 | | | 6744-12 | 2911-12 | 6488-20 | Shipping | 6744-12 |
| 6609-12 | | | | | 6498-10 | 6420-11 | |
| 6610-9 | | | 2911-12 | Elevating | 6608-11-13 | 6531-16-18 | |
| 6615-10 | | | | 6291-24 | | -19 | |
| 6626-6 | | | | 6405-21 | 2911-11 | 6609-12 | |
| 6676-8 | | | | 6498-10 | | 6696-9-10 | |
| 6692-11 | | | | 6513-11 | | | |
| 6696-9-10 | | | | 6608-12-13 | | | |
| 6744-12 | | | | 6610-9 | | | |
| | | | | 6744-12 | | | |
| 2911-10-11 | | | | 2911-12 | | | |

### COSTS - MATERIAL UNITS

| Crusher plates | Balls | Mill liners | Water | Screen | Conveyor belts | Fuel |
|---|---|---|---|---|---|---|
| 6607-8 | 6498-7 | 6498-7 | 6421-8 | 6446-12 | 6592-7 | 6498-11 |
| | 6513-9 | 6513-9 | 6581-8 | 6554-11 | 6607-6-7 | 6580-15 |
| | 6522-9 | 6522-9 | 6676-5 | 6580-11 | -10 | 6581-8 |
| Hammers | 6553-6 | 6553-6 | | 6581-7 | 6676-5 | 6599-7 |
| 6553-6 | 6554-11 | 6608-8 | | 6582-8 | 6705-5 | 6692-12 |
| 6554-11 | 6608-8-9 | 6610-8 | | 6592-12 | | 6705-10 |
| | -10 | | | 6607-6-9 | | |
| | | | | -11 | | |
| | | Pump | | 6609-8-9 | | |
| | Pebbles | liners | Pipe | 6615-8 | | Drier |
| | 6553-6 | 6607-12 | 6607-12 | 6652-7-8 | | 6420-6 |
| | 6610-8 | | | 6676-5-6 | | 6498-6-11 |
| | | | | 6692-6-8 | | 6608-7-11 |



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## NONMETAL MILLING - Continued

### COSTS - LABOR UNITS

| Milling | | Crushing | Grinding | Screening | Drying | Supervision | Tons per shift |
|---|---|---|---|---|---|---|---|
| 6291-7-21 | 6607-19 | 6448-16 | 6448-16 | 6420-11 | 6420-11 | 6420-11 | 6405-22 |
| 6405-22 | 6610-10 | 6483-21 | 6438-21 | 6615-10 | 6448-16 | 6580-15 | 6446-20 |
| 6446-20 | 6615-10 | 6608-13 | 6608-13 | | 6438-21 | 6607-19 | 6608-13 |
| 6488-21 | 6652-11 | 6615-10 | | | 6608-13 | 6676-19 | 6610-10 |
| 6522-15 | 6676-9 | | | | | | 6615-10 |
| 6553-5 | 6705-10 | | | Conveying | | | |
| 6580-15 | | | | 6488-21 | | | 2911-12 |
| 6592-12 | | | | | | | |

| Track | Aerial tram | Loading | Storage | Sampling | Power | Miscel. |
|---|---|---|---|---|---|---|
| 6420-11 | 6488-21 | 6420-11 | 6421-17 | 6488-21 | 6615-10 | 6420-11 |
| 6615-10 | 6615-10 | | | | | 6592-12 |

### COSTS - POWER UNITS

| Crushing | Grinding | Screening | Conveying | Elevating | Washing | Drying | Storage |
|---|---|---|---|---|---|---|---|
| 6405-22 | 6405-22 | 6405-22 | 6405-22 | 6405-22 | 6446-20 | 6420-11 | 6580-15 |
| 6446-20 | 6438-21 | 6420-11 | 6446-20 | 6446-20 | 6607-19 | 6488-21 | 6607-19 |
| 6488-21 | 6498-11 | 6446-20 | 6488-21 | 6498-11 | 6676-9 | 6498-11 | 6676-9 |
| 6498-11 | 6513-12 | 6580-15 | 6498-11 | 6513-12 | 6692-12 | 6608-13 | 6705-10 |
| 6513-12 | 6554-11 | 6582-10 | 6513-12 | 6582-10 | 6705-10 | 6744-13 | 6744-13 |
| 6580-15 | 6608-13 | 6607-19 | 6580-15 | 6610-10 | 6744-13 | | |
| 6603-6 | 6610-10 | 6676-9 | 6607-19 | 6692-12 | | Light- | Total |
| 6607-19 | | 6692-12 | 6610-10 | 6705-10 | Shops | ing | milling |
| 6608-13 | | 6705-10 | 6615-10 | 6744-13 | 6405-22 | 6405-22 | 6488-21 |
| 6610-10 | | 6744-13 | 6676-9 | | 6498-11 | 6498-11 | 6582-10 |
| 6615-10 | | | 6692-12 | | 6580-15 | 6580-15 | 6607-19 |
| 6676-9 | | | 6705-10 | Pumping | 6607-19 | 6607-19 | 6652-10 |
| 6692-12 | | | 6744-13 | 6580-15 | 6676-9 | 6676-9 | -11 |
| 6705-10 | | | | 6582-10 | 6705-10 | 6692-12 | |
| 6744-13 | | | | 6676-9 | | 6705-10 | |

| Pneumatic classifier | Engine plane | Car dump | Sampling |
|---|---|---|---|
| 6483-18 | 6607-19 | 6446-20 | 6488-21 |
| | 6676-9 | | |



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